MOONS'
moving in better ways

Stepper Motor

RoHS Compliant

Stepper Motor

Stepper Motors

Standard stepper motors

IP65 Type Stepper Motors

Brake Type Stepper Motors

Planetary Reducer Motors

Encoder Type Stepper Motors

Special Type Stepper Motors

Configurations and Options

Introduction of Stepping Motors

What is Stepping Motor

Stepping Motors provide precise position and speed control, without the need for feedback devices to sense position. The operation of step motors is controlled through electrical pulses that the drive converts to current flowing through the windings of the motor. As the current is switched the motor rotates in precise steps of a fixed angle. The motor and drive constitutes a low cost control system that is precise and simple to construct.

Performance Features of MOONS' Stepping Motors

- **Accurate Position Control**
  The number of control pulses defines the motor shaft position. Position error is very small (less than 1/10th of a degree), and non cumulative.

- **Precise Motor Speed**
  Step motor running speed, is exactly determined by the frequency of the control pulses. Because the speed is very precise and easy to control, step motors are often used where coordinated motion control is needed.

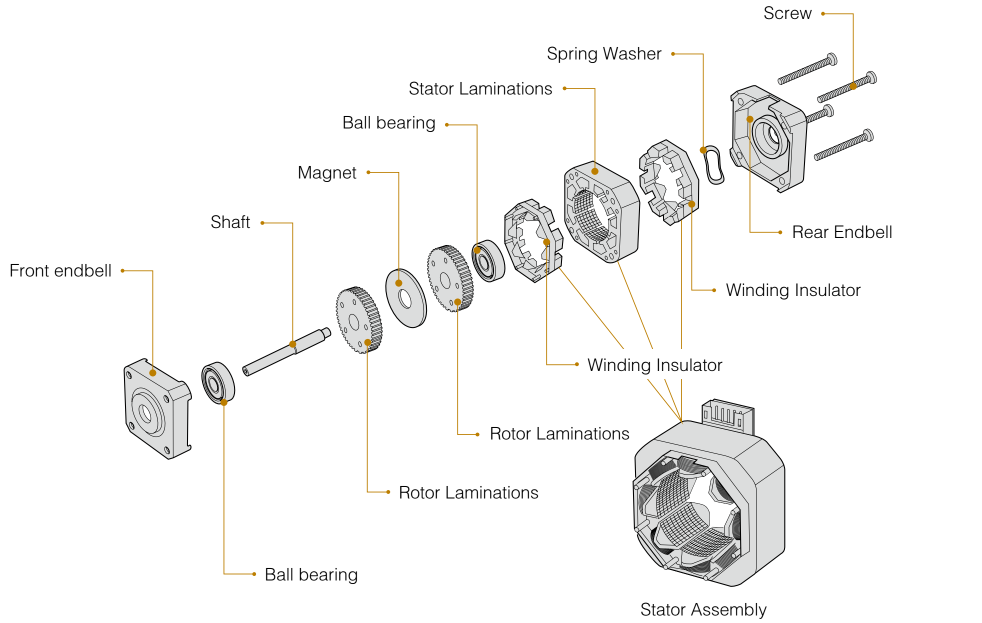
- **Forward & Reverse, Pause and Holding Function**
  Motor torque and position control is effective throughout the entire speed range, including zero speed holding torque. The zero speed holding torque locks the shaft at the desired position to hold the load in place.

- **Low Speed Operation**
  Step motors produce a large amount of torque, and are easy to control, at low speeds. This often eliminates the need for speed reduction gearboxes, reduces costs and saves space.

- **Long Life**
  The brushless design of step motors leads to motors with a very long life. Step motor life is usually determined by the life of the bearings.

Basic Structure and Motor Operation

- **Basic Structure**

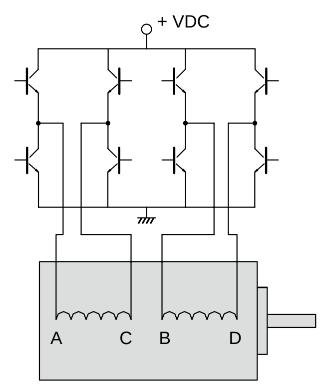


- **Operating Principles**

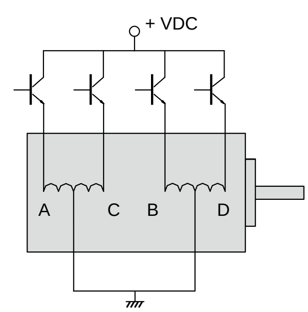
In response to each individual control pulse and direction signal, the drive applies power to the motor windings to cause the rotor to take a step forward, a step in reverse, or lock in position.

For example, in a 1.8 degree two phase step motor: When both phases are energized with DC current, the motor will stop rotating and hold in position. The maximum torque the motor can hold in place with rated DC current, is the rated holding torque. If the current in one phase is reversed, the motor will move 1 step (1.8 degrees) in a known direction. If the current in the other phase had been reversed, the motor would move 1 step (1.8 degrees) in the other direction. As current is reversed in each phase in sequence, the motor continues to step in the desired direction. These steps are very accurate. For a 1.8 degree step motor, there are exactly 200 steps in one revolution.

Two phase stepping motors are furnished with two types of windings: bipolar or unipolar. In a bipolar motor there is one winding on each phase. The motor moves in steps as the current in each winding is reversed. This requires a drive with eight electronic switches. In a unipolar motor there are two windings on each phase. The two windings on each phase are connected in opposite directions. Phase current is reversed by turning on alternate windings on the same phase. This requires a drive with only four electronic switches. Bipolar operation typically provides 40% more holding torque than unipolar, because 100% of the winding is energized in the bipolar arrangement.



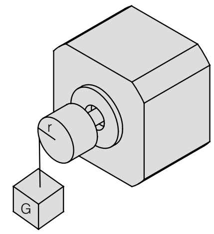
2 phase step motor with bipolar driver

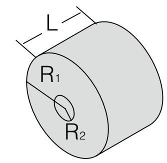


2 phase step motor with unipolar driver

Technical Data and Terminology

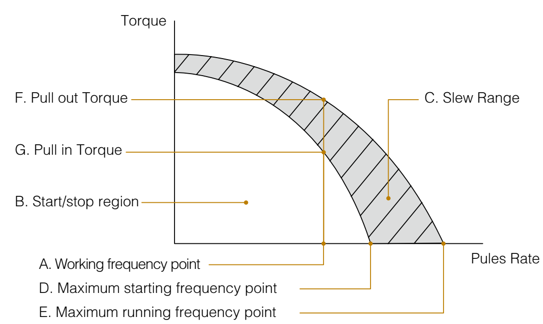
- **Load Calculations**





A. Torque load (Tf)
  Tf = G * r
  G: weight
  r: radius
B. Inertia load (TJ)
  TJ = J * dw/dt
  J = M * (R1
  2+R2
  2) / 2 (Kg * cm)
  M: mass
  R1: outside radius
  R2: inside radius
  dw/dt: angle acceleration

- **Speed-Torque Characteristics**



The dynamic torque curve is an important aspect of stepping motor's output performance. The followings are some keyword explanations.

A. Working frequency point express the stepping
  motors rotational speed value at this point
  n = q * Hz / (360 * D)
  n: rev/sec
  Hz: the frequency value at this point
  D: the subdividing value of motor driver
  q: the step angle of stepping moto

  E.g.: 1.8° stepping motor, in the condition of I/2 subdividing (each step 0.9°) runs at 500Hz its speed is 1.25r/s.

B. Start/Stop region: the region in which a stepping motor can be directly started or stopped.

C. Slew Range: the motor cannot be started directly in this area. It must be started in the start/stop region first and then accelerated to this area. In this area, the motor can not be directly stopped, either Otherwise this will lead to losing-step. The motor must be decelerated back to the start/stop region before it can be stopped.

D. Maximum starting frequency point at this point, the stepping motor can reach its maximum starting speed under unloaded condition.

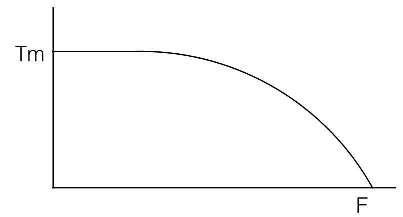
E. Maximum running frequency point at this point the stepping motor can reach its maximum running speed under an unloaded condition.

F. Pull-in Torque: the maximum dynamic torque value that a stepping motor can load directly at the particular operating frequency point.

G. Pull-out Torque: the maximum dynamic torque value that a stepping motor can load at the particular operating frequency point when the motor has been started. Because of the inertia of rotation the Pull-Out. Torque is always larger than the Pull-In Torque.

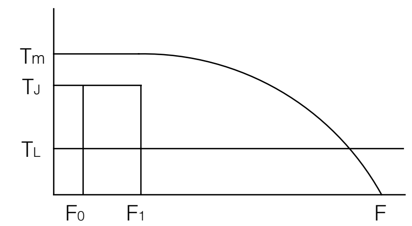
- **Calculate the Acceleration Torque**

How to accelerate or decelerate in the shortest time is the most important when the system's operating frequency point is in the slew range of the dynamic torque curve graph.

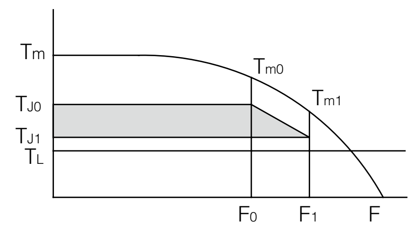


It is shown by the following graph: the dynamic torque's performance of stepping motor will always keep a horizontal straight line in low speed. But in high speed, the curve will slope

A. Accelerated Motion of Straight Line
Motor's load value is known as TL, it has to be accelerated from F0 to F1 in the shortest time (tr), what is the value of tr?
(1). Generally TJ = 70%Tm
(2). tr = 1.8 * 10 -5 * J * q * (F1-F0)/(TJ-TL)
(3). F (t) = (F1-F0) * t/tr + F0, 0<t<tr



B. Exponential Acceleration
(1). Generally
TJ0 = 70%Tm0,
TJ1 = 70%Tm1,
TL = 60%Tm1
(2). tr = F4 * In [(TJ0-TL)/(TJ1-TL)]
(3). F (t) = F2 * [1 – e^(-t/F4)] + F0, 0<t<tr
F2 = (TL-TJ0) * (F1-F0)/(FJ1-TJ0)
F4 = 1.8 * 10-5 * J * q * F2/(TJ0-TL)



Note:
J is the torque inertia of motor rotor plus its load, q is the angle of each step, it equals to the step angle of stepping motor when motor runs in full step.
As for the control of deceleration, it can be realized by turning the accelerate pulse frequency above-mentioned.

- **Reduction of Vibration and Noise**

In a non-loading condition, stepping motors may appear to have vibration or even lose steps when the motor is running at or close to resonant frequency.

Solutions for these conditions

A. Have the motor operate outside of this speed range.

B. By adopting the micro-step driving method, you can divide one step into multiple steps thereby reducing the vibration, Micro-step is used for increasing a motor's step resolution. This is accomplished by controlling the motor's phase current ratio. Micro-step does not increase step accuracy. However it will allow a motor to run more smoothly and with less noise When the motor runs in half step mode the motor torque will be 15% less than running in full step mode If the motor is controlled by sine wave current the motor torque will be reduced by 30%.

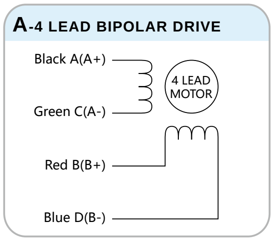
Numbering System

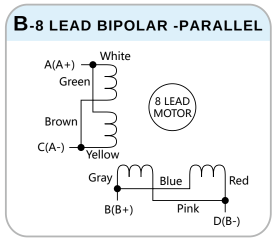
AM 17 HD 0 0 01 - 01

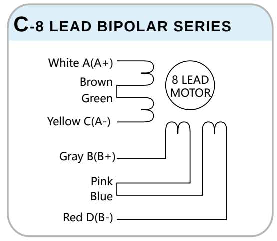
1 2 3 4 5 6 7

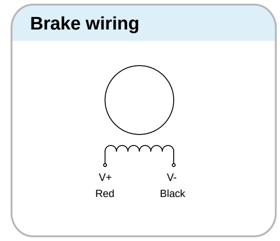
1. Motion Control Standard Series
2. Size: Motor outside diameter in tenths of an inch (Ex: size 17 = 1.7”) (6:14mm; 8:20 mm; 11:28 mm; 14:35 mm; 17:42 mm; 23:56 mm; 24:60 mm; 34:86 mm; 42:110mm)
3. Series:
   HY, HS, HD, HM: step angle 1.8°
4. Length of stator
5. Number of lead wires
   0: Connector type
   4: 4 lead wires
   8: 8 lead wires
6. Electric variation: variety of current, torque, etc.
7. Mechanical variation: variety of shaft, lead wires, screws, etc.
   -F1000D Encoder type, -PGXX Gearbox type, -BR01 Brake type

Wiring Diagrams







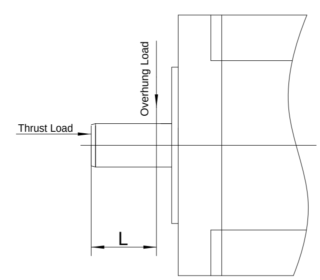


Generall Specifications

Specifications		Parameter
Step Accuracy		±5%(Tested by: Constant Current Drive/24V/Two Phase On/Rated Current/Full Step:1rps)
Insulation Class		Class B(130°C)
Operating Environment	Ambient Temperature	-20~+50°C(non-freezing)
	Ambient Humidity	85% or less (non-condensing)
	Atmosphere	No corrosive gases, dust, water or oil
Temperature Rise		Temperature rise of windings is 80˚C (144˚F) or less measured by the resistance change method. (at rated voltage, at standstill, two phases excited)
Shaft Runout		0.050T.I.R.(mm)
Radial Play		0.02mm Max.(500gf)
Axial Play		0.08mm Max.(500gf)
Concentricity		0.075T.I.R.(mm)
Perpendicularity		0.100T.I.R.(mm)

Permissible Overhung Load and Permissible Thrust Load (Unit:N)

Type	Permissible Overhung Load Distance(L) from Shaft End(mm)					Permissible Thrust Load
	0mm	5mm	10mm	15mm	20mm	
6HY	12	15	20	---	---	Less than the motor mass
8HY	12	15	20	---	---	
11HS	20	25	34	52	- - -	
14HS	20	25	34	52	- - -	
17HD	20	25	34	52	- - -	
23HS	50	60	75	100	150	
24HS	61	73	90	110	160	
34HD / HM	260	290	340	390	480	
42HS	390	435	510	585	720	



Motor Installation

Mounting Direction

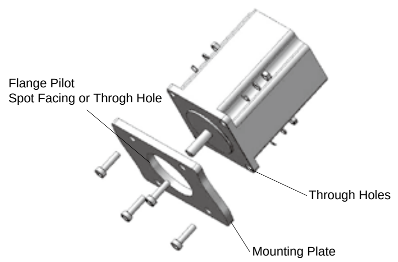
Motors can be mounted freely in any direction as shown below.

Regardless of how the motor is mounted, take care not to apply an overhung load or thrust load on the shaft. Make sure the cable does not contact the mounting surface causing undesirable force on the cable.

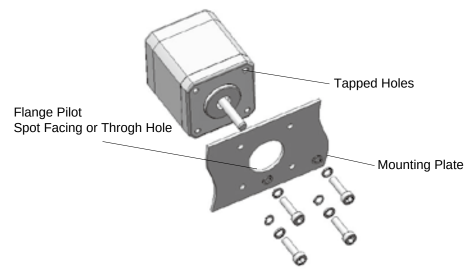
Mounting Method

Considering heat radiation and vibration isolation as much as possible, mount the motor tightly against a metal plane.

Mounting Method for Through Hole Type



Mounting Method for Tapped Hole Type



Installation Conditions

Install the motor in a location that meets the following conditions, or the product may be damaged.

- Indoors (This product is designed and manufactured to be installed within another device.)
- Ambient temperature: -20~+50°C(non-freezing)
- Ambient humidity: 85% or less (non-condensing)
- Not exposed to explosive, flammable or corrosive gases
- Not exposed to direct sunlight
- Not exposed to dust
- Not exposed to water or oil
- A place where heat can escape easily
- Not exposed to continuous vibration or excessive impact

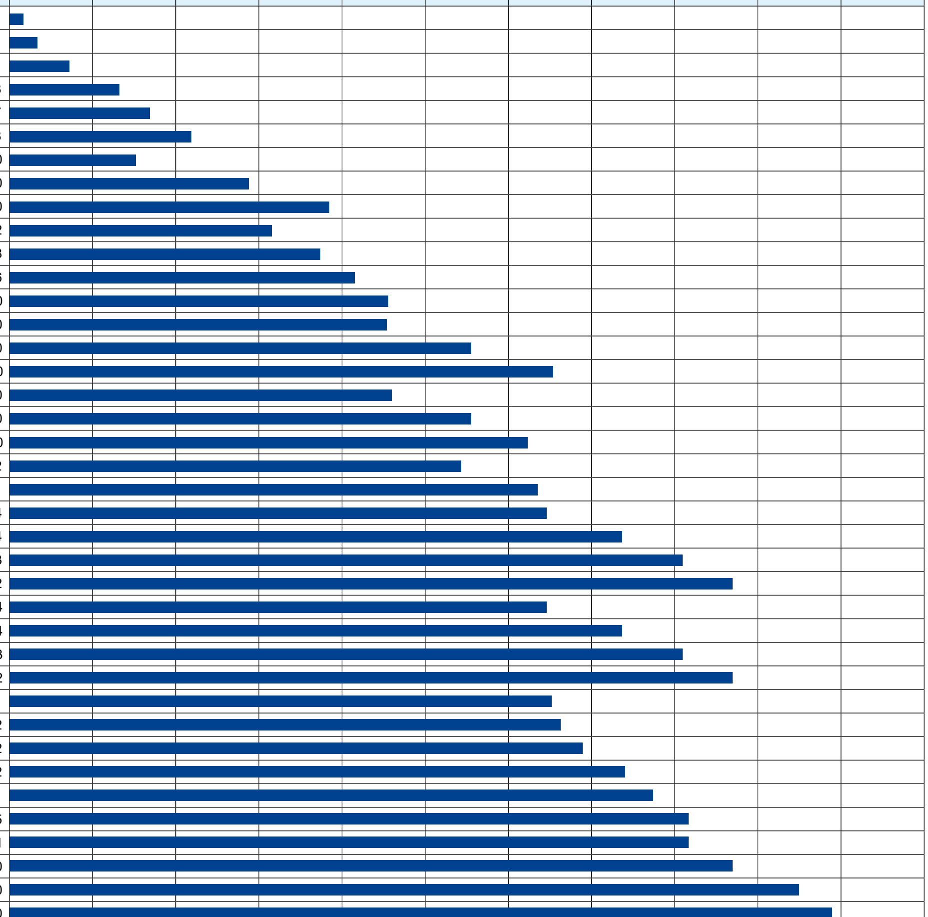
Notes:

When installing the motor in an enclosed space such as a control box, or somewhere close to a heat-radiating object, vent holes should be used to prevent the motor from overheating.

Do not install the motor in a location where a source of vibration will cause the motor to vibrate.

Quick Selection Of Motor

Size			Model	The torque range (mN. M); Speed range 0 ~ 50 RPS										
Base (mm)	Thickness (mm)	Series		0	50	100	200	400	800	1600	3200	6400	12800	26500
14	30	NEMA6	AM6HY04A0											
20	29.5	NEMA8	AM8HY2050											
	46.5		AM8HY4043											
28	31	NEMA11	AM11HS1008											
	40		AM11HS3007											
	51		AM11HS5008											
35	27.3	NEMA14	AM14HS10A0											
	36		AM14HS30A0											
	55.5		AM14HS50A0											
42	34.3	NEMA17	AM17HD4452											
	39.8		AM17HD2438											
	48.3		AM17HD6426											
	62.8		AM17HDB410											
57	39	NEMA23	AM23HS04A0											
	55		AM23HS84A0											
	77		AM23HSA4A0											
	39		AM23HS04B0											
	55		AM23HS84B0											
	77		AM23HSA4B0											
60	55	NEMA24	AM24HS2402											
	85		AM24HS5401											
86	66.5	NEMA34	AM34HD0404											
	96		AM34HD1404											
	125.5		AM34HD2403											
	156		AM34HD3402											
86	63	NEMA34	AM34HM0404											
	91		AM34HM1404											
	119		AM34HM2403											
	147.5		AM34HM3402											
60	85	NEMA24	AM24HS5411											
86	66.5	NEMA34	AM34HD0802											
	75		AM34HD4802											
	96		AM34HD1802											
	115		AM34HD6801											
	125.5		AM34HD2805											
86	104	NEMA34	AM34HM6801											
110	98.5	NEMA42	AM42HS04A0											
	149.5		AM42HS24A0											
	201		AM42HS34A0											
Base (mm)	Thickness (mm)	Series	Model	0	0.05	0.1	0.2	0.4	0.8	1.6	3.2	6.4	12.8	25.6
Size				The torque range (mN. M); Speed range 0 ~ 50 RPS										



NEMA6(□14mm) 2-phase DC 1.8°- 6HY series

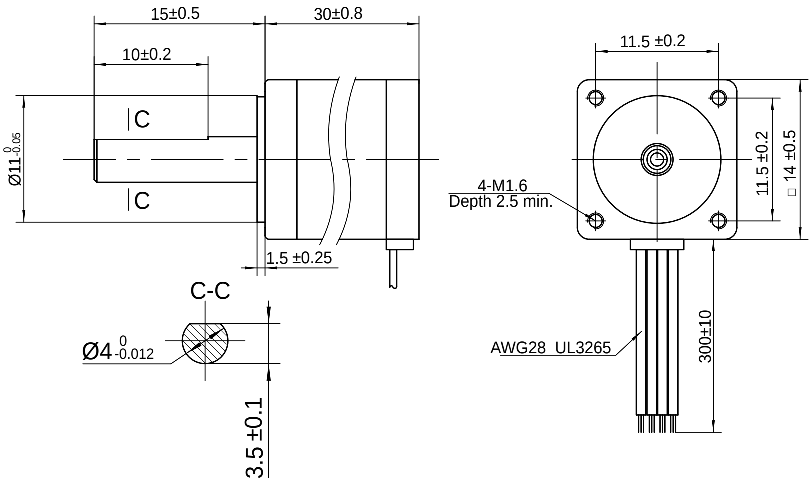
The 14mm series hybrid stepping motor solves the bottleneck problem encountered in the application design of hybrid stepping motors in devices with very limited space: NEMA6 square motor has small inertia, high response, large torque, low noise, Low vibration characteristics make it a key core component in small space applications.

Parameters

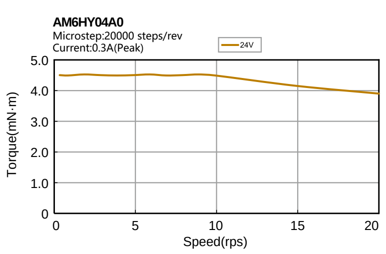
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm^2	Kg	
AM6HY04A0-01N	Single Shaft	A	4	30	0.0058	0.3	22.0	5.8	0.03	500VAC 1 minute

* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Dimensions (Unit: mm)



Torque Curves



NEMA8(□20mm) 2-phase DC 1.8°- 8HY Series

Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 6 N (1.3 Lbs.)Push, 25 N (5.6 Lbs.)Pull
Radial: 18 N (4 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

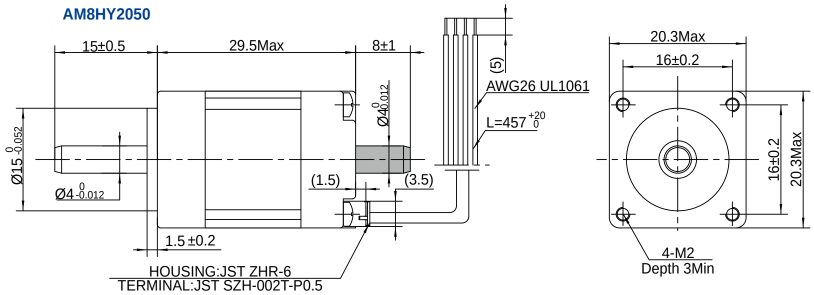
Parameters

Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM8HY2050-01N	Single Shaft	A	4	29.5	0.02	0.35	11.5	1.6	0.04	500VAC 1 minute
AM8HY2050-02N	Double Shaft									
AM8HY4043-01N	Single Shaft			46.5	0.042		20.3	4.2	0.09	
AM8HY4043-02N	Double Shaft									

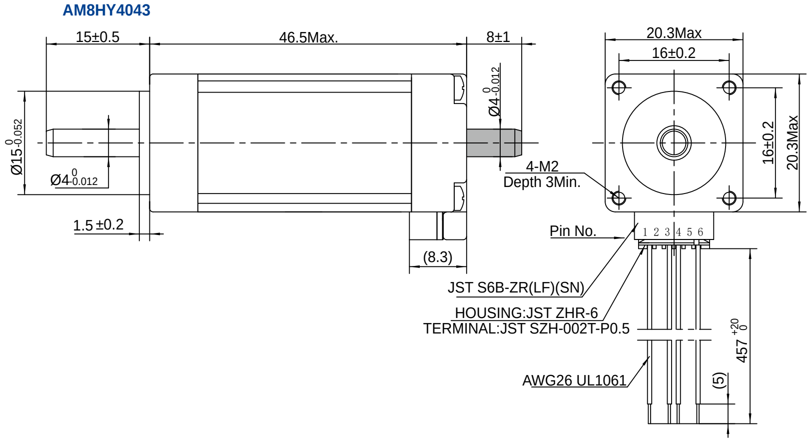
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

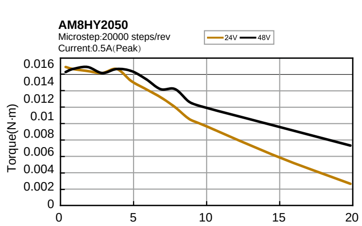
AM8HY2050

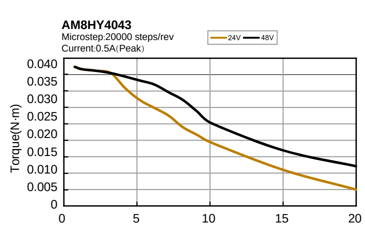


AM8HY4043

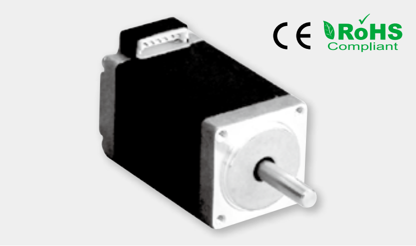


Torque Curves





NEMA11(□28mm) 2-phase DC 1.8°- 11HS Series



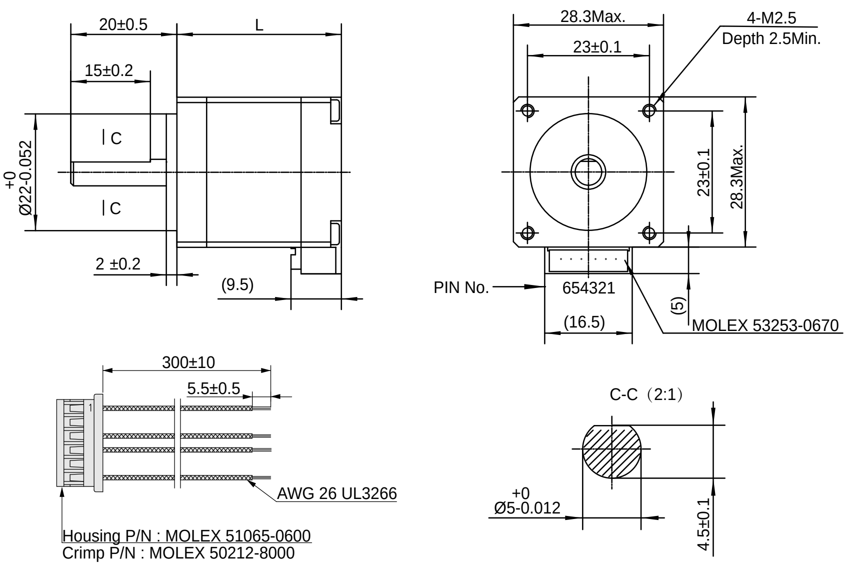
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 15 N (3.4 Lbs.)Push, 25 N (5.6 Lbs.)Pull
Radial: 30 N (6.5 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

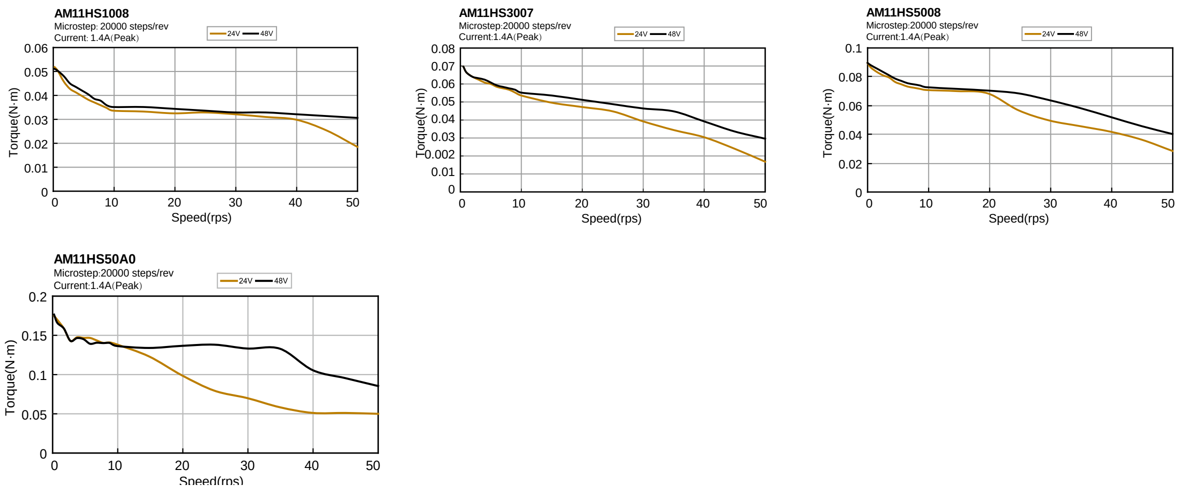
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM11HS1008-07	Single Shaft	A	4	31.0	0.072	1.0	2.5	9.0	0.1	500VAC 1 minute
AM11HS3007-02	Single Shaft			40.0	0.082		1.7	12.0	0.15	
AM11HS5008-01	Single Shaft			51.0	0.125		3.5	18.0	0.2	
AM11HS50A0-01	Single Shaft			51.0	0.2		4.4	18.0	0.2	

* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

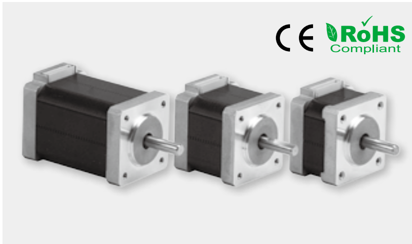
Dimensions (Unit: mm)



Torque Curves



NEMA14(□35mm) 2-phase DC 1.8°- 14HS Series



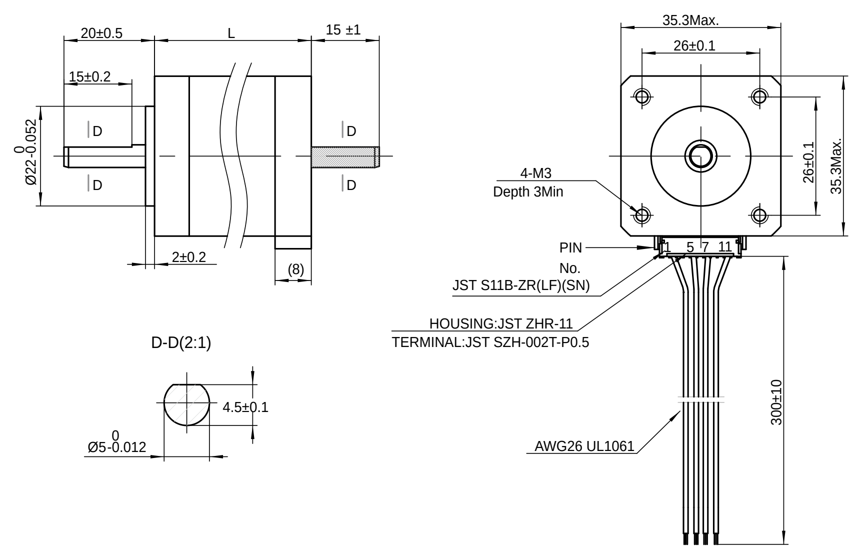
Phases: 2
Steps / Revolution: ±5%
Step Accuracy: 25 N (5.6 Lbs.)Push, 65 N (15 Lbs.)Pull
Radial: 30 N (6.5 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

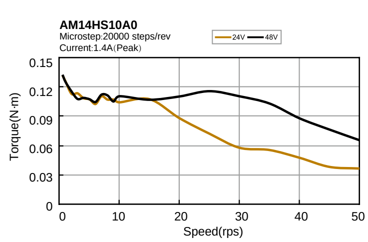
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM14HS10A0-01	Single Shaft	A	4	27.3	0.14	1.0	3.3	12.0	0.15	500VAC 1 minute
AM14HS10A0-02	Double Shaft									
AM14HS30A0-01	Single Shaft			36	0.23		3.4	20.0	0.21	
AM14HS30A0-02	Double Shaft									
AM14HS50A0-01	Single Shaft			55.5	0.4		5.1	35.0	0.24	
AM14HS50A0-02	Double Shaft									

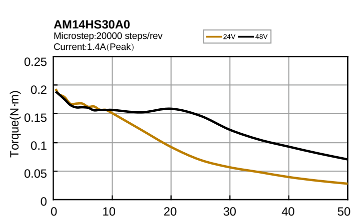
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

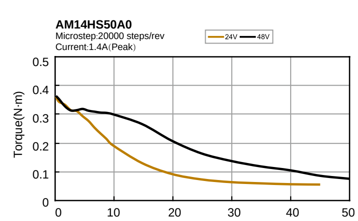
Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.



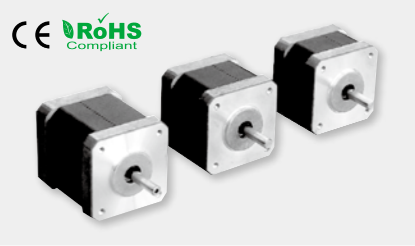
Torque Curves







NEMA17(□42mm) 2-phase DC 1.8°- 17HD Series



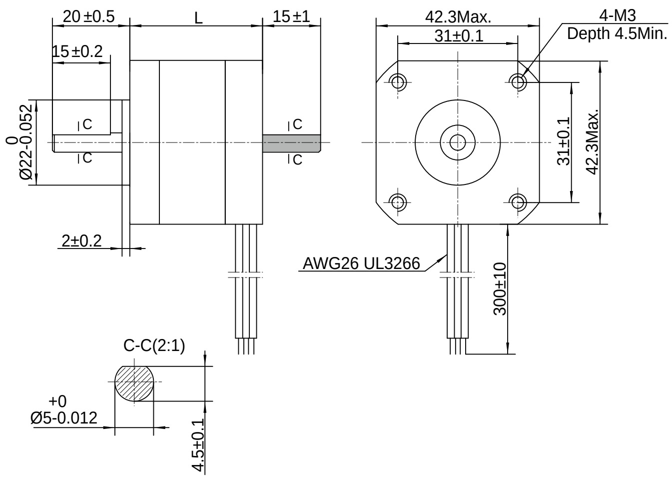
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 25 N (5.6 Lbs.)Push, 65 N (15 Lbs.)Pull
Radial: 30 N (6.5 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

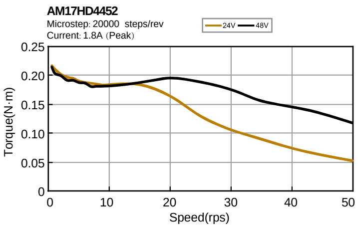
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM17HD4452-02N	Single Shaft	A	4	34.3	0.285	1.5	1.5	38.0	0.23	500VAC 1 minute
AM17HD4452-01N	Double Shaft									
AM17HD2438-02N	Single Shaft			39.8	0.46		1.9	57.0	0.28	
AM17HD2438-01N	Double Shaft									
AM17HD6426-06N	Single Shaft			48.3	0.59		2.3	82.0	0.36	
AM17HD6426-05N	Double Shaft									
AM17HDB410-01N	Single Shaft			62.8	0.85	1.4	3.2	123.0	0.6	
AM17HDB410-02N	Double Shaft									

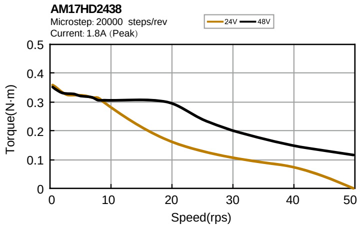
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

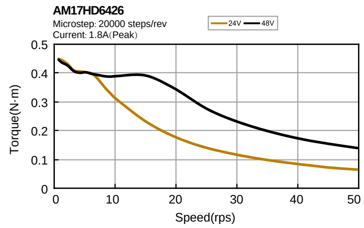
Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

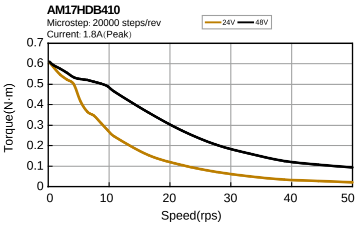


Torque Curves

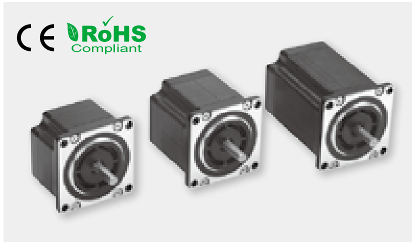








NEMA23(□56mm) 2-phase DC 1.8°- 23HS Series（6.35mm Shaft）



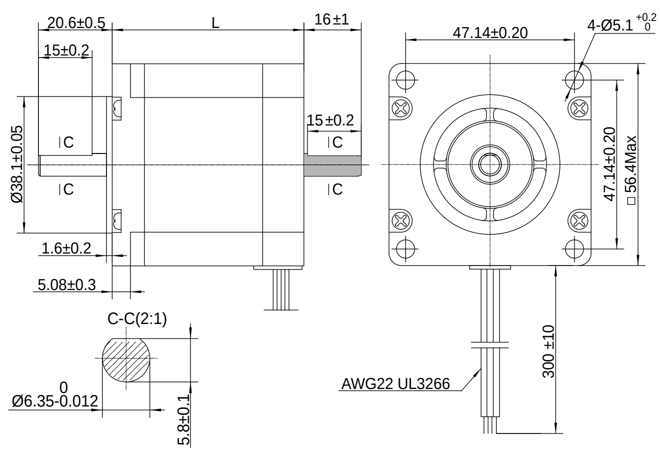
Phases: 2
Steps / Revolution: ±5%
Step Accuracy: 40 N (9 Lbs.)Push, 130 N (30 Lbs.)Pull
Radial: 70 N (15.5 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

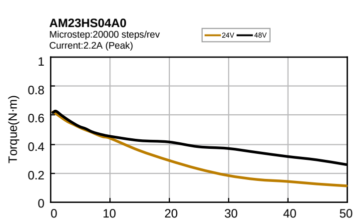
Model	Shaft	Wiring *	Leads	Length"L" mm	Holding Torque N.m	Current ※ A /Phase	Resistance Ω/Phase	Rotor Inertia g·cm²	Mass Kg	Dielectric Strength
AM23HS04A0-01	Single Shaft	A	4	39	0.82	1.8	1.8	105.0	0.4	500VAC 1 minute
AM23HS04A0-02	Double Shaft									
AM23HS84A0-01	Single Shaft			55	1.5		2.4	215.0	0.6	
AM23HS84A0-02	Double Shaft									
AM23HSA4A0-01	Single Shaft			77	2.3		3	365.0	1.0	
AM23HSA4A0-02	Double Shaft									
AM23HS04B0-01	Single Shaft			39	0.82	3.7	0.48	105.0	0.4	
AM23HS04B0-02	Double Shaft									
AM23HS84B0-01	Single Shaft			55	1.5		0.63	215.0	0.6	
AM23HS84B0-02	Double Shaft									
AM23HSA4B0-01	Single Shaft			77	2.3		0.75	365.0	1.0	
AM23HSA4B0-02	Double Shaft									

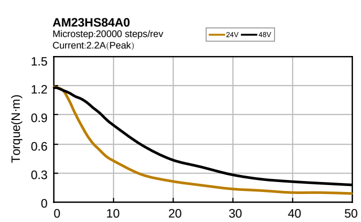
* Wiring Diagram A See Page 9 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

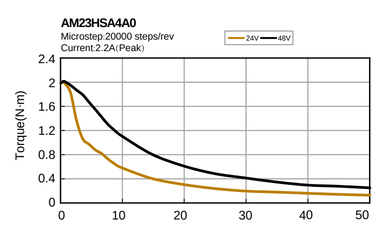
Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

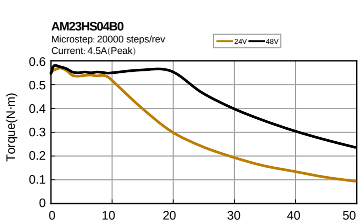


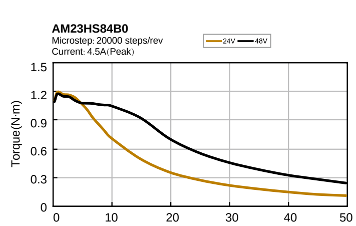
Torque Curves

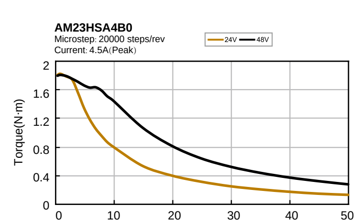


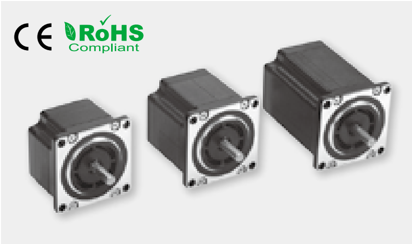












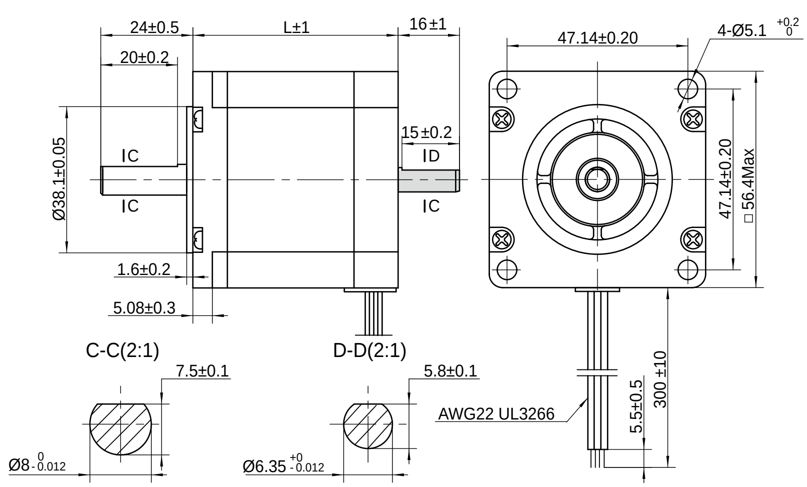
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 40 N (9 Lbs.)Push, 130 N (30 Lbs.)Pull
Radial: 70 N (15.5 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

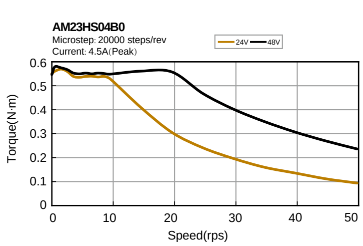
Model	Shaft	Wiring *	Leads	Length"L" mm	Holding Torque N.m	Current ※ A /Phase	Resistance Ω/Phase	Rotor Inertia g·cm^2	Mass Kg	Dielectric Strength
AM23HS04B0-03	Single Shaft	A	4	39	0.82	3.7	0.48	105.0	0.4	500VAC 1 minute
AM23HS04B0-04	Double Shaft									
AM23HS84B0-03	Single Shaft			55	1.5		0.63	215.0	0.6	
AM23HS84B0-04	Double Shaft									
AM23HSA4B0-03	Single Shaft			77	2.3		0.75	365.0	1.0	
AM23HSA4B0-04	Double Shaft									

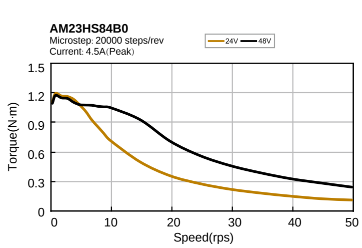
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

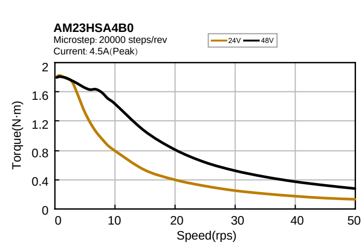
Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.



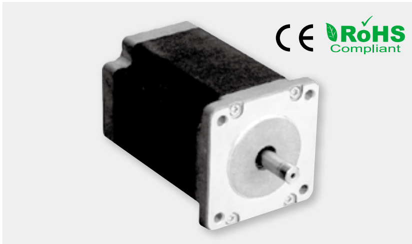
Torque Curves







NEMA24(□60mm) 2-phase DC 1.8°- 24HS Series



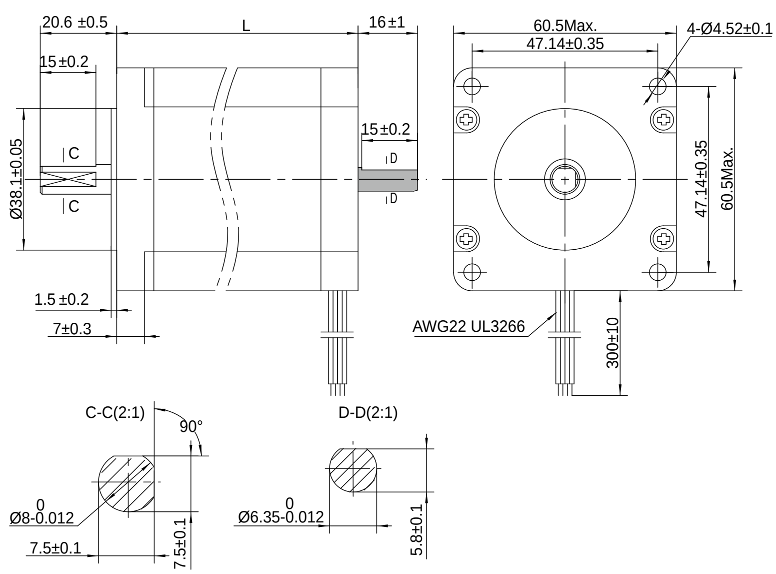
Phases: 2
Steps / Revolution: ±5%
Step Accuracy: 40 N (9 Lbs.)Push, 130 N (30 Lbs.)Pull
Radial: 70 N (15.5 Lbs.)At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

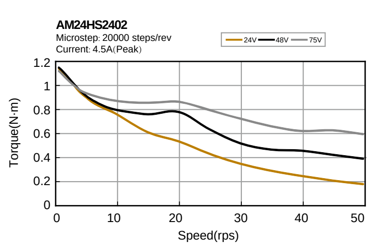
Model	Shaft	Wiring *	Leads	Length"L" mm	Holding Torque N.m	Current ※ A /Phase	Resistance Ω/Phase	Rotor Inertia g·cm²	Mass Kg	Dielectric Strength
AM24HS2402-08N	Single Shaft	A	4	54.0	1.57	4.0	0.43	450.0	0.83	500VAC 1 minute
AM24HS2402-11N	Double Shaft									
AM24HS5401-10N	Single Shaft			85.0	3.2		0.65	900.0	1.4	
AM24HS5401-24N	Double Shaft									

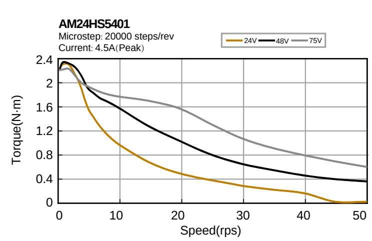
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

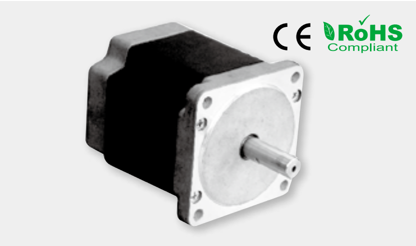


Torque Curves





NEMA34(□86mm) 2-phase DC 1.8°- 34HD Series



Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 65 N (15 Lbs.)Push, 155 N (35 Lbs.)Pull
Radial: 220 N (50 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

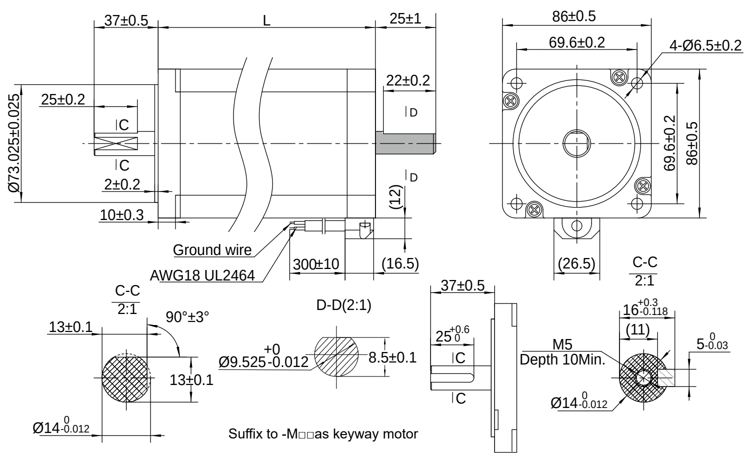
■ Parameters

Model		Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
Double Flat Shaft	Key-way Shaft				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM34HD0404-08	AM34HD0404-M08	Single Shaft	A	4	66.5	3.7	6.3	0.25	1100.0	1.6	500VAC 1 minute
AM34HD0404-09	AM34HD0404-M09	Double Shaft									
AM34HD1404-06	AM34HD1404-M06	Single Shaft			96.0	6.7		0.35	1850.0	2.7	
AM34HD1404-07	AM34HD1404-M07	Double Shaft									
AM34HD2403-07	AM34HD2403-M07	Single Shaft			125.5	9.4	5.6	0.49	2750.0	3.8	
AM34HD2403-08	AM34HD2403-M08	Double Shaft									
AM34HD3402-01	AM34HD3402-M01	Single Shaft			156.0	11.5		0.63	4400.0	5.2	
AM34HD3402-02	AM34HD3402-M02	Double Shaft									

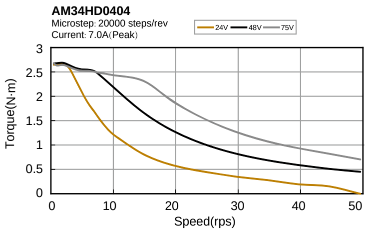
* Wiring Diagram A See Page 9 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

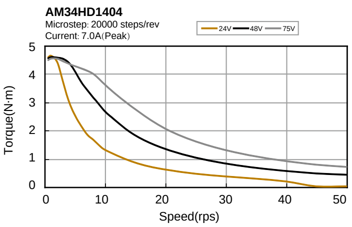
Notice：P/N AM34HD0404-08 is double flats shaft, P/N AM34HD0404-M08 is Key-way shaft, please notice the suffix of the P/N.

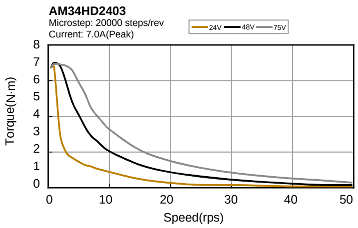
■ Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

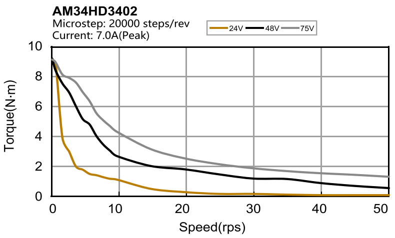


■ Torque Curves









NEW

NEMA34(□86mm) 2-phase DC 1.8°- 34HM Series

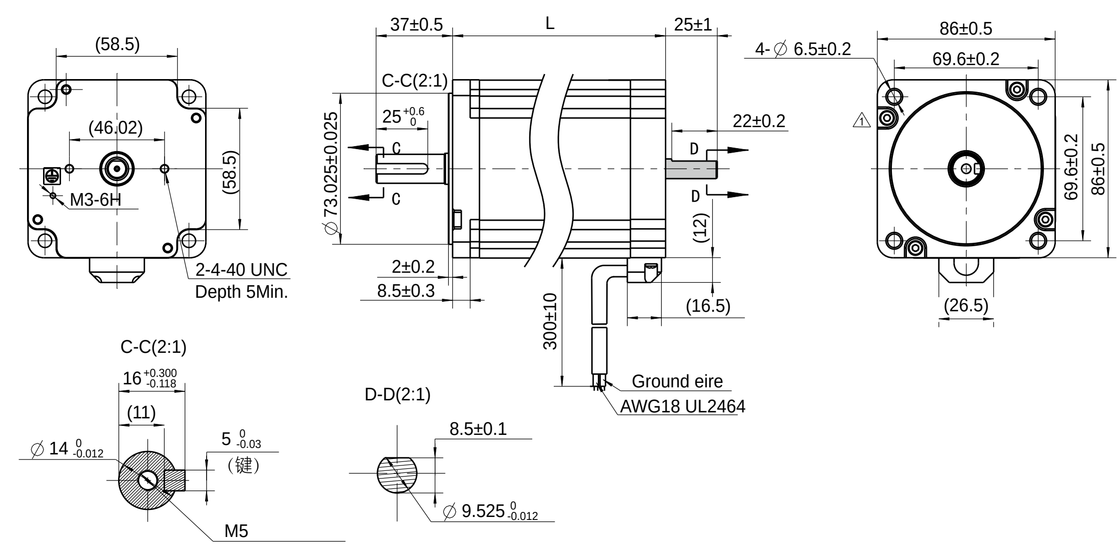
Phases: 2
Steps / Revolution: ±5%
Step Accuracy: 65 N (15 Lbs.)Push, 155 N (35 Lbs.)Pull
Radial: 220 N (50 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

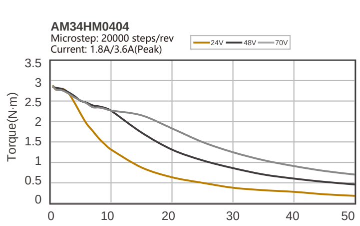
Model / Key-way Shaft	Shaft	Wiring *	Leads	Length"L" mm	Holding Torque N.m	Current ※ A /Phase	Resistance Ω/Phase	Rotor Inertia g·cm²	Mass Kg	Dielectric Strength
AM34HM0404-S	Single Shaft	A	4	63	3.7	6.3	0.23	1300	1.6	500VAC 1 minute
AM34HM0404-D	Double Shaft									
AM34HM1404-S	Single Shaft			91	6.4		0.3	1850	2.7	
AM34HM1404-D	Double Shaft									
AM34HM2403-S	Single Shaft			119	9.4	5.6	0.46	2750	3.8	
AM34HM2403-D	Double Shaft									
AM34HM3402-S	Single Shaft			147.5	11.5		0.6	5160	5.2	
AM34HM3402-D	Double Shaft									

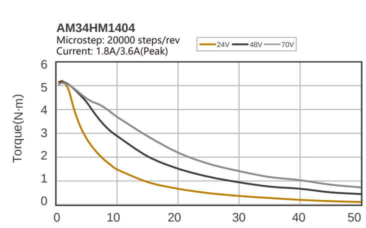
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

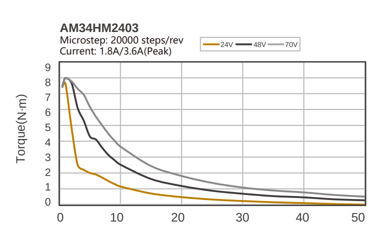
Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

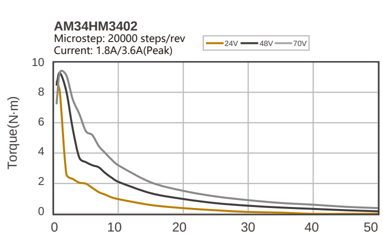


Torque Curves

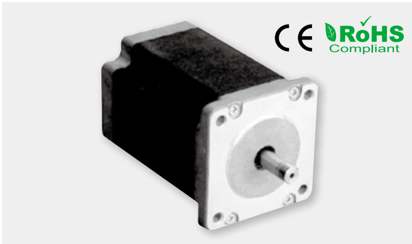








NEMA24(□60mm) 2-phase AC 1.8°- 24HS Series



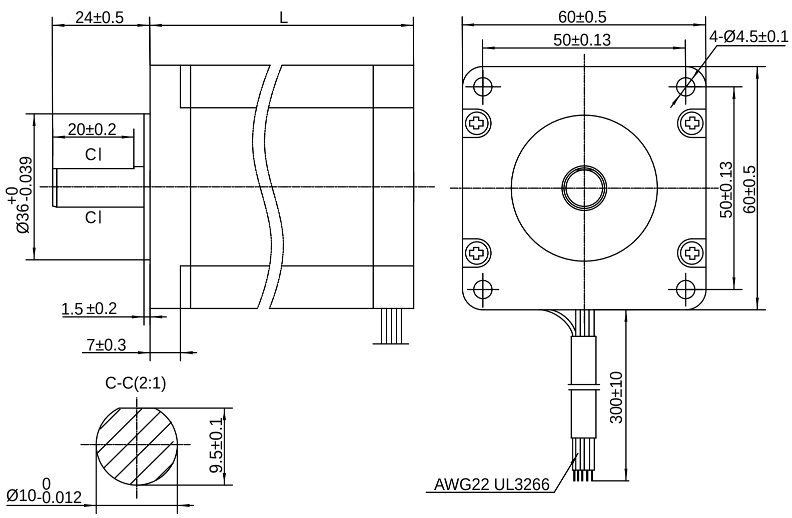
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 40 N (9 Lbs.)Push, 130 N (30 Lbs.)Pull
Radial: 70 N (15.5 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

■ Parameters

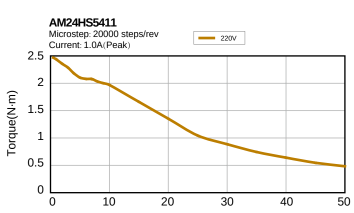
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm^2	Kg	
AM24HS5411-01N	Single Shaft	A	4	85	3.1	0.8	15.4	900.0	1.4	1500VAC 1 minute

* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

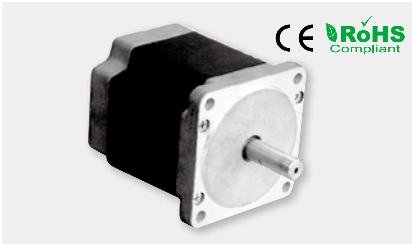
■ Dimensions (Unit: mm)



■ Torque Curves



NEMA34(□86mm) 2-phase AC 1.8°- 34HD Series



Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 65 N (15 Lbs.)Push, 155 N (35 Lbs.)Pull
Radial: 220 N (50 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

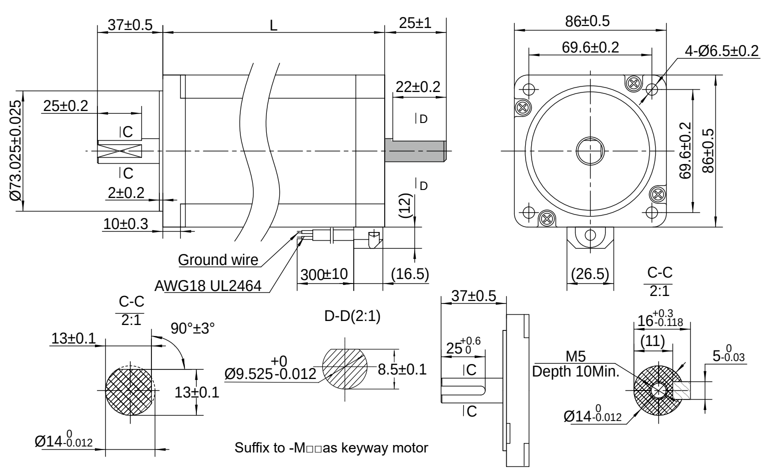
Parameters

Model		Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
Double Flat Shaft	Key-way Shaft				mm	N.m	A /Phase	Ω/Phase	g·cm^2	Kg	
AM34HD0802-01	AM34HD0802-M01	Single Shaft	B (Parallel) C (Series)	8	66.5	4.2	1.8 (220V Series) / 3.6 (110V Parallel)	3.4(Series)	1100.0	1.6	1500VAC 1 minute
AM34HD0802-02	AM34HD0802-M02	Double Shaft									
AM34HD4802-01	-	Single Shaft			75	4.7		3.6(Series)	1350.0	1.9	
AM34HD1802-01	AM34HD1802-M01	Single Shaft			96	7.3		3.6(Series)	1850.0	2.7	
AM34HD1802-03	AM34HD1802-M03	Double Shaft									
AM34HD6801-01	-	Single Shaft			115	7.6		4(Series)	2400.0	3.5	
AM34HD2805-01	AM34HD2805-M01	Single Shaft			125.5	8.7		4.2(Series)	2750.0	3.8	
AM34HD2805-03	AM34HD2805-M03	Double Shaft									

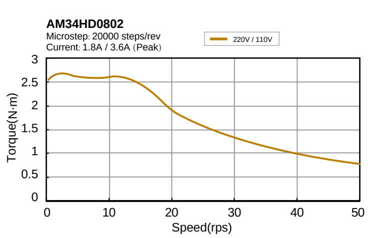
* Wiring Diagram B/C See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

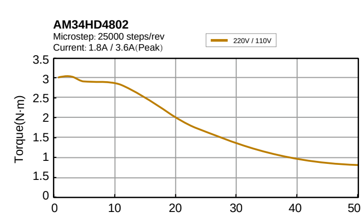
Notice：P/N AM34HD0802-01 is double flats shaft, P/N AM34HD0802-M01 is Key-way shaft, please notice the suffix of the P/N.

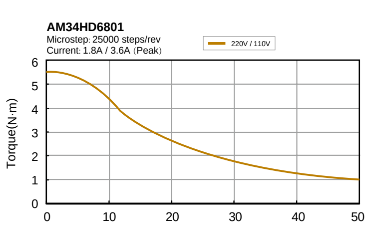
Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.

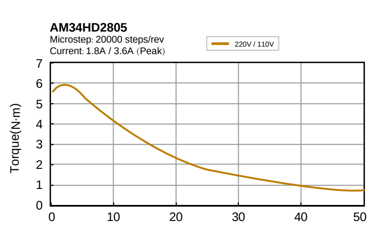


Torque Curves









NEW

NEMA34(□86mm) 2-phase AC 1.8°- 34HM Series

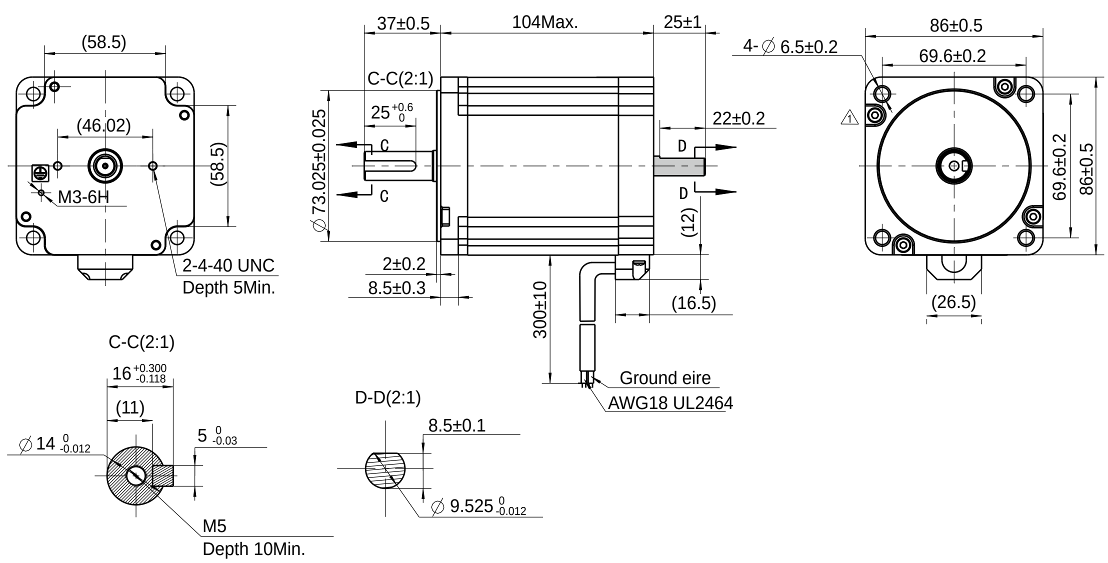
Phases: 2
Steps / Revolution: ±5%
Step Accuracy: 65 N (15 Lbs.)Push, 155 N (35 Lbs.)Pull
Radial: 220 N (50 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

■ Parameters

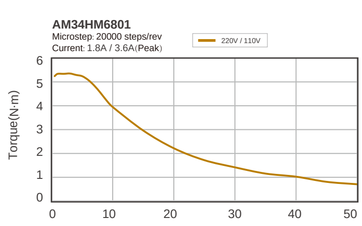
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
Key-way Shaft				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM34HM6801-S	Single Shaft	A	4	104	7.6	1.8(220V)	3.7	3100	3.5	1500VAC 1 minute
AM34HM6801-D	Double Shaft									

* Wiring Diagram B/C See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Dimensions (Unit: mm) These dimensions are for the double shaft models. For the single shaft models, ignore the ( ) area.



■ Torque Curves



NEMA42(□110mm) 2-phase AC 1.8°- 42HS Series

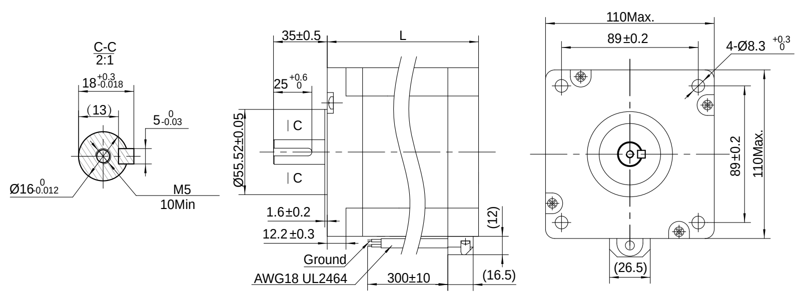
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 250 N (56 Lbs.)Push, 250 N (56 Lbs.)Pull
Radial: 450 N (100 Lbs.) At End of Shaft
IP Rating: 40
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

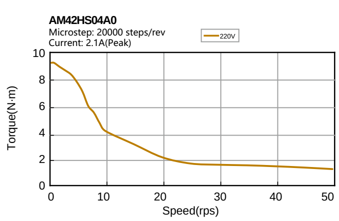
Model	Shaft	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
				mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM42HS04A0-01	Single Shaft	A	4	98.5	12	2.1	4.2	5500	4.8	1500VAC 1 minute
AM42HS24A0-01				149.5	21	2.4	4.4	10900	8	
AM42HS34A0-01				201	30	2.7	4.4	16200	11.6	

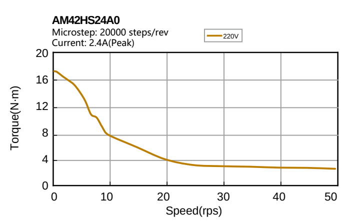
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

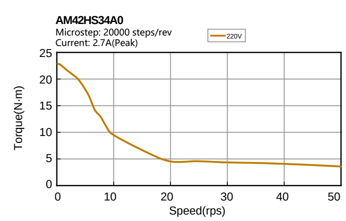
Dimensions (Unit: mm)



Torque Curves

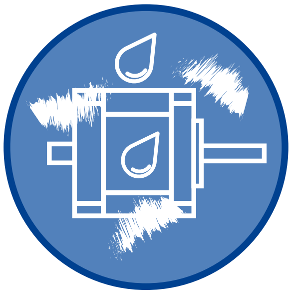




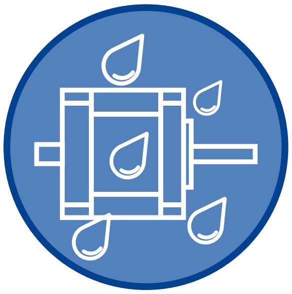


IP65 Type Motor

The IP (Ingress Protection) protection level system was drafted by the IEC (International Electro Technical Commission). The electrical appliances are classified according to their characteristics of dustproof, foreign object intrusion, waterproof and moisture proof. The foreign objects referred to here, including tools, human fingers, etc., must not touch the live parts of the appliance to avoid electric shock.



Dust Protection



Water Protection

Different Length

NEMA23(□56mm) 2-phase DC 1.8°- 23HS Series IP65 Type

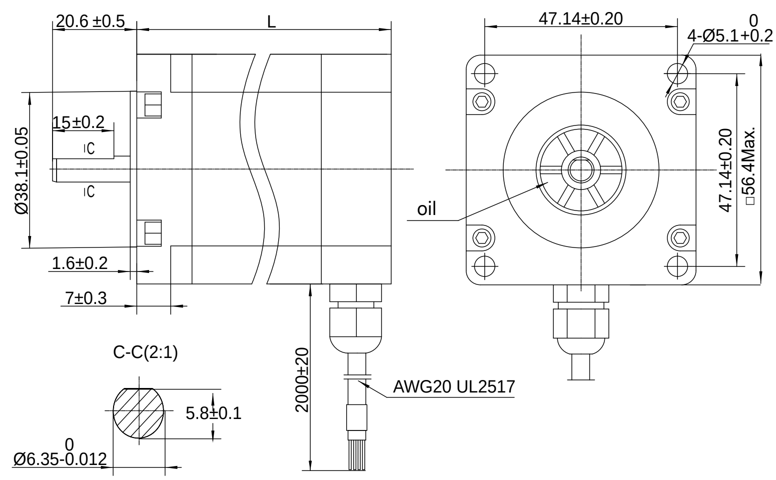
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 40 N (9 Lbs.)Push, 130 N (30 Lbs.)Pull
Radial: 70 N (15.5 Lbs.) At End of Shaft
IP Rating: 65
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

■ Parameters

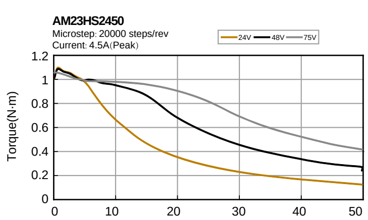
Model	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
			mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM23HS2450-03	A	4	61.7	1.25	3.7	0.63	260.0	0.6	500VAC 1 minute
AM23HS3455-05			83.7	2.2		0.75	460.0	1	

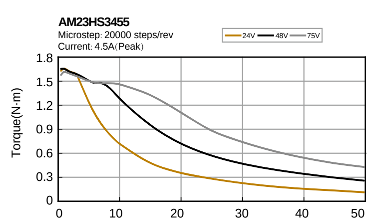
* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Dimensions (Unit: mm)



■ Torque Curves





NEMA24(□60mm) 2-phase DC 1.8°- 24HS Series IP65 Type

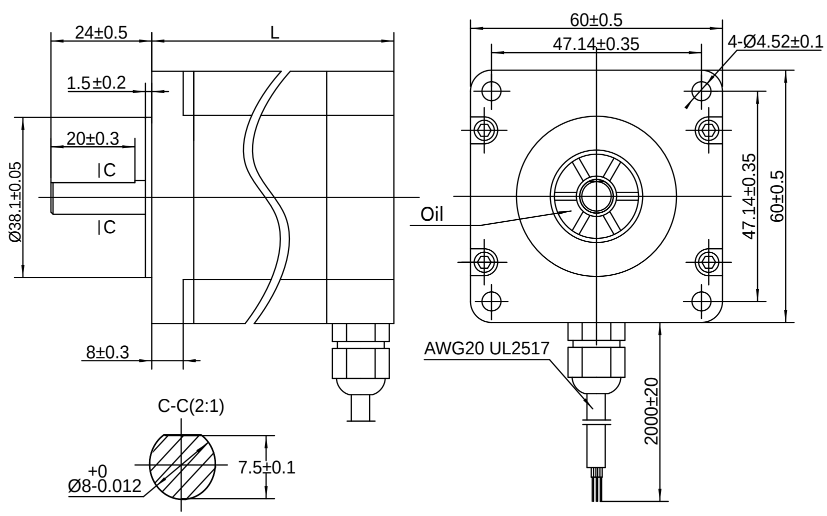
Phases: 2
Steps / Revolution: ± 5%
Step Accuracy: 40 N (9 Lbs.)Push, 130 N (30 Lbs.)Pull
Radial: 70 N (15.5 Lbs.) At End of Shaft
IP Rating: 65
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

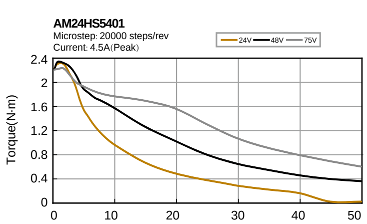
Model	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
			mm	N.m	A /Phase	Ω/Phase	$g\cdot cm^2$	Kg	
AM24HS5401-44N	A	4	94.5	3.2	4.0	0.7	900.0	1.4	500VAC 1 minute

* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Dimensions (Unit: mm)



Torque Curves



NEMA34(□86mm) 2-phase DC 1.8°- 34HD Series IP65 Type

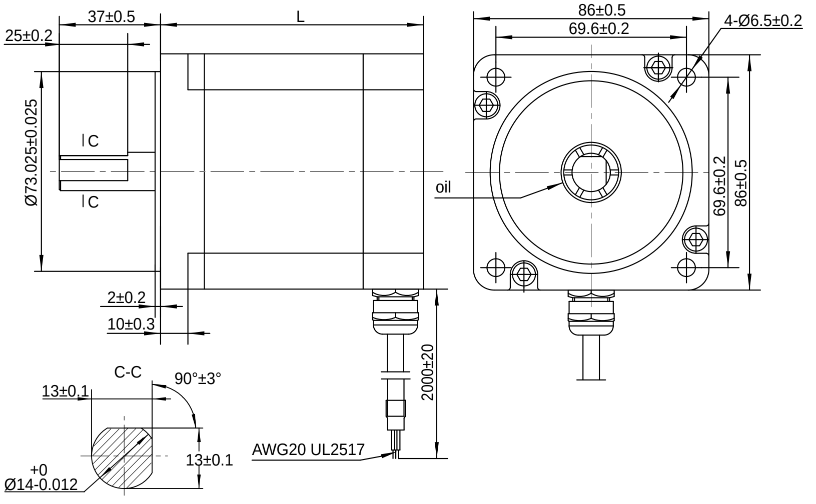
Phases: 2
Steps / Revolution: ±5%
Step Accuracy: 65 N (15 Lbs.)Push, 155 N (35 Lbs.)Pull
Radial: 220 N (50 Lbs.) At End of Shaft
IP Rating: 65
Operating Temp: −20°C to +50°C
Insulation Class: B, 130°C
Insulation Resistance: 100 MegOhms

Parameters

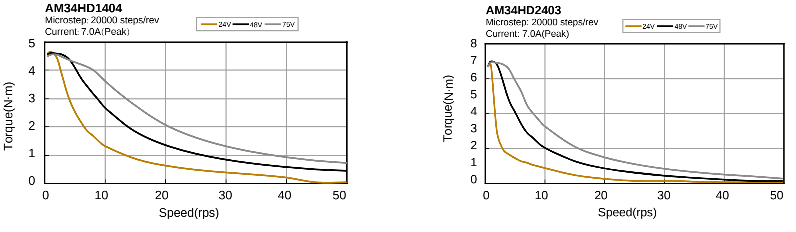
Model	Wiring *	Leads	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Mass	Dielectric Strength
			mm	N.m	A /Phase	Ω/Phase	g·cm²	Kg	
AM34HD1404-13	A	4	98	6.7	6.3	0.45	1850.0	2.7	500VAC 1 minute
AM34HD2403-13			127.5	9.4	5.6	0.62	2750.0	3.8	

* Wiring Diagram A See Page 8 ※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Dimensions (Unit: mm)



Torque Curves



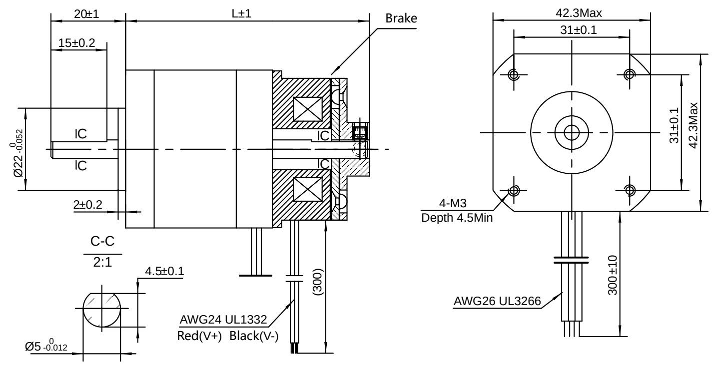
Brake Type Motor

Electromagnetic brake, when the motor is powered off, the brake system is activated instantly, and the motor shaft is firmly locked to prevent the equipment from falling down due to the working load, so as to keep the work stopped in its original position. Release in time after power on does not affect the normal operation of the motor.

The brake motor provided by MOONS' uses the permanent magnet brake. Compared with ordinary spring brakes, permanent magnet brakes are compact in structure and easy to install. They have low noise, fast response, long life, low heat, and low consumption. Many advantages such as low electricity, it is an ideal modern automation actuator, suitable for high-precision positioning applications of stepper motors, brushless motors, servo motors.

NEMA17(□42mm) 2-phase DC 1.8°- 17HD Series Brake Type

■ Dimensions (Unit: mm)

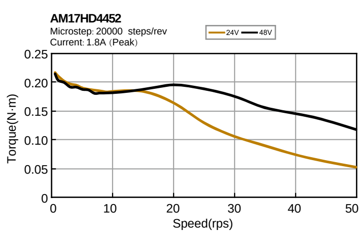


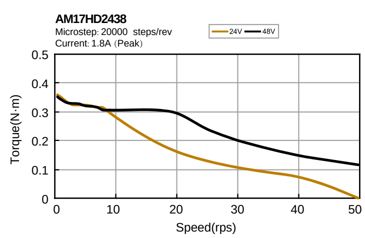
■ Parameters

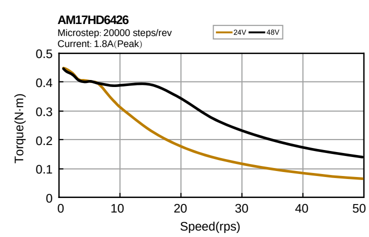
Model	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Brake Torque	Brake Power	Mass	Dielectric Strength
	mm	N.m	A /Phase	Ω/Phase	g·cm^2	N.m	W	Kg	
AM17HD4452-BR01	61.3	0.285	1.5	1.5	38.0	0.6	5	0.38	500VAC 1 minute
AM17HD2438-BR01	66.8	0.46	1.5	1.9	57.0	0.6	5	0.43	
AM17HD6426-BR01	75.3	0.59	1.5	2.3	82.0	0.6	5	0.51	
AM17HDB410-BR01	89.8	0.85	1.4	3.2	123.0	0.6	5	0.75	

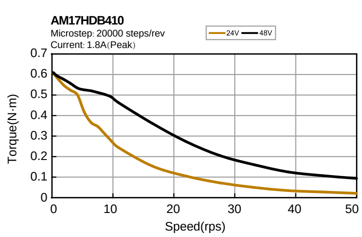
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Torque Curves

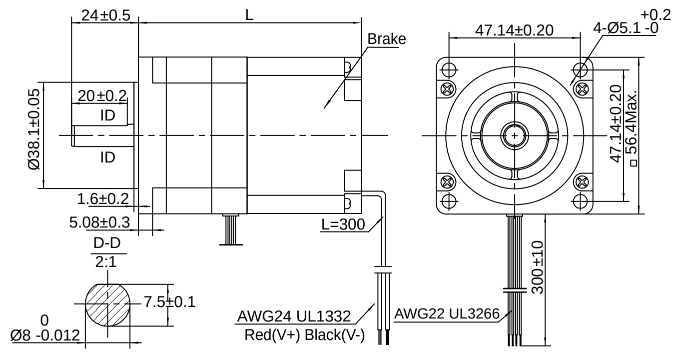








■ Dimensions (Unit: mm)

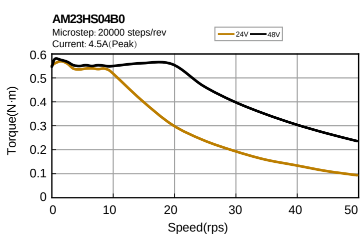


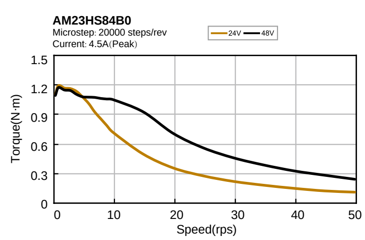
■ Parameters

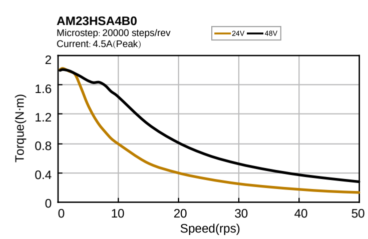
Model	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Brake Torque	Brake Power	Mass	Dielectric Strength
	mm	N.m	A /Phase	Ω/Phase	g·cm²	N.m	W	Kg	
AM23HS04B0-BR01	80	0.82	3.7	0.48	105.0	1.5	5	0.62	500VAC 1 minute
AM23HS84B0-BR01	96	1.5		0.63	215.0	1.5	5	0.8	
AM23HSA4B0-BR01	118	2.3		0.75	365.0	1.5	5	1.2	

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Torque Curves

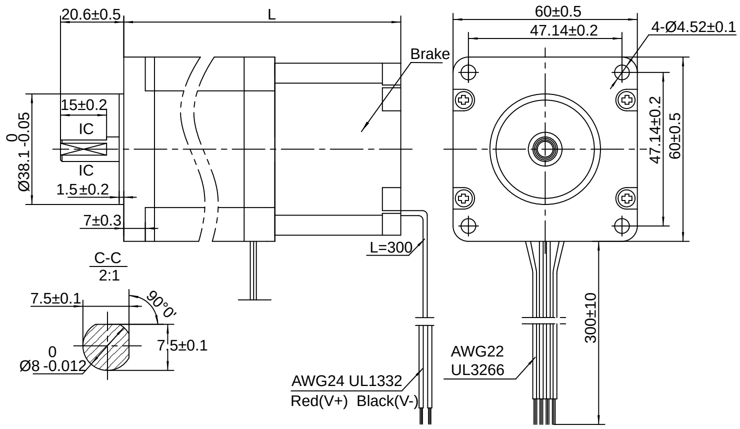






NEMA24(□60mm) 2-phase DC 1.8°- 24HS Series Brake Type

■ Dimensions (Unit: mm)

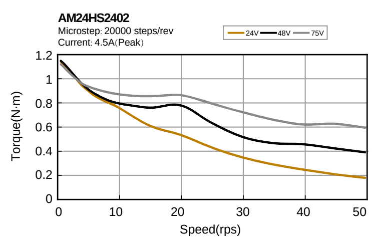


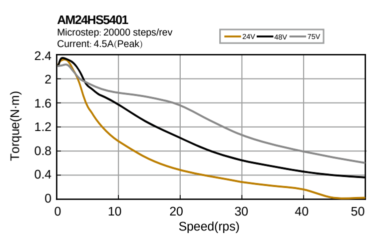
■ Parameters

Model	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Brake Torque	Brake Power	Mass	Dielectric Strength
	mm	N.m	A /Phase	Ω/Phase	g·cm²	N.m	W	Kg	
AM24HS2402-BR01	95	1.57	4.0	0.43	450.0	1.5	5	1.03	500VAC 1 minute
AM24HS5401-BR01	126	3.2		0.65	900.0	1.5	5	1.6	

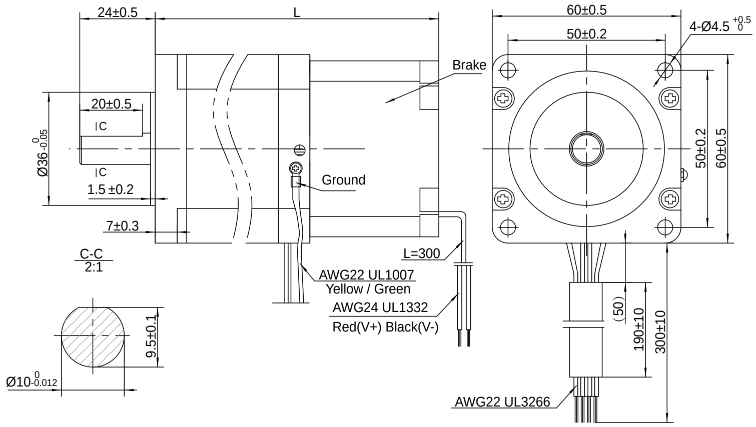
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Torque Curves





Dimensions (Unit: mm)

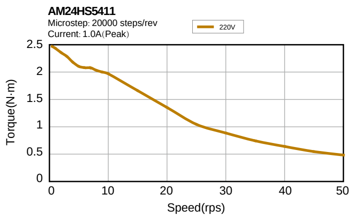


Parameters

Model	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Brake Torque	Brake Power	Mass	Dielectric Strength
	mm	N.m	A /Phase	Ω/Phase	g·cm²	N.m	W	Kg	
AM24HS5411-BR01	126	3.1	0.8	15.4	900.0	1.5	5	1.6	1500VAC 1 minute

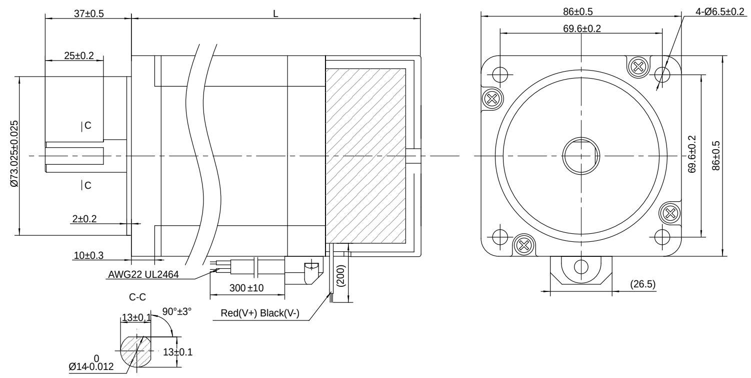
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Torque Curves



NEMA34(□86mm) 2-phase DC 1.8°/ 2-phase AC 1.8°-34HD Series Brake Type

Dimensions (Unit: mm)

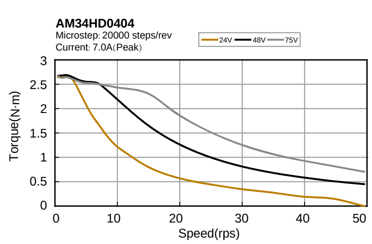


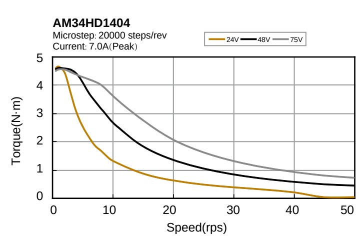
Parameters

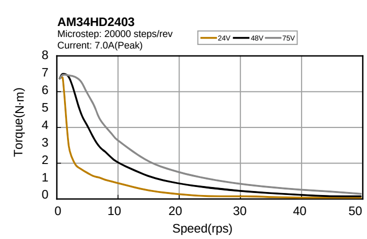
Model	Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Brake Torque	Brake Power	Mass	Dielectric Strength
	mm	N.m	A /Phase	Ω/Phase	g·cm²	N.m	W	Kg	
AM34HD0404-BR01	118.5	3.7	6.3	0.25	1100	6	8	2.2	500VAC 1 minute
AM34HD1404-BR01	148	6.7	6.3	0.35	1850	6	8	3.3	
AM34HD2403-BR01	177.5	9.4	5.6	0.49	2750	6	8	4.4	
AM34HD0802-BR01	118.5	4.2	1.8 (220VAC Series)	3.4 (Series)	1100	6	8	2.2	1500VAC 1 minute
AM34HD1802-BR01	148	7.3	1.8 (220VAC Series)	3.6 (Series)	1850	6	8	3.3	
AM34HD2805-BR01	177.5	8.7	1.8 (220VAC Series)	4.2 (Series)	2750	6	8	4.4	

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

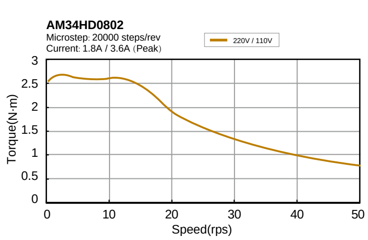
Torque Curves

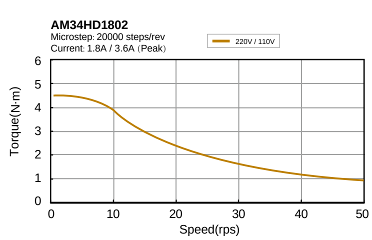


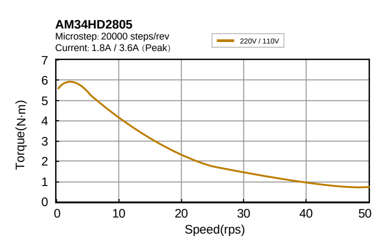




Torque Curves





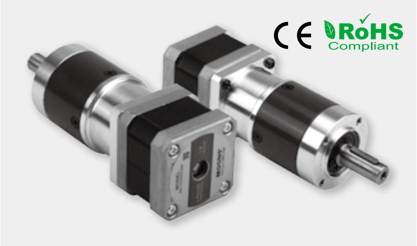


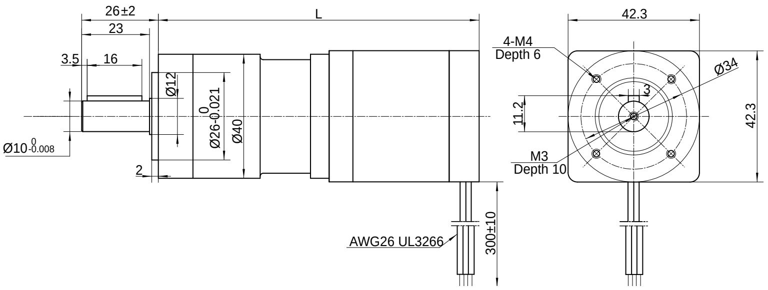
Gearbox Type Motor

MOONS' motors use precision planetary gearbox, with high rated torque, low backlash, and low noise. Conventional reduction ratios are 5:1; 10:1; 20:1. Other reduction ratios can be consulted by phone.

NEMA17(□42mm) 2-phase DC 1.8°- 17HD Series Gearbox Type

■ Dimensions (Unit: mm)



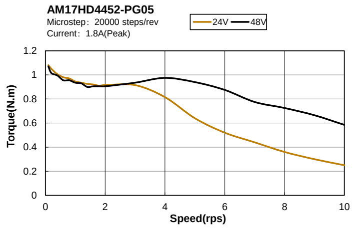


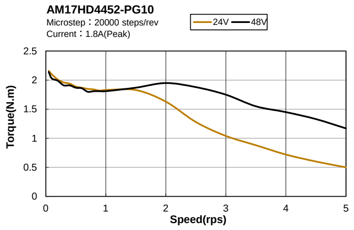
■ Parameters

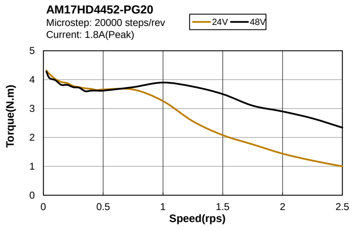
Model	Length"L"	Current ※	Series	Reduction ratio	Accuracy	Maximum output torque	Maximum load torque	Rotor Inertia	Efficiency	Noise	Mass
	mm	A/Phase			arc-min	N.m	N.m	g·cm^2		dB	Kg
AM17HD4452-PG05	101.8	1.5	1	5	12	1.25	6	950	96%	<60	0.55
AM17HD4452-PG10	101.8		1	10	12	2.5	4	3800	96%	<60	0.55
AM17HD4452-PG20	114.8		2	20	15	5	20	15200	94%	<60	0.63
AM17HD2438-PG05	107.3		1	5	12	2	6	1425	96%	<60	0.6
AM17HD2438-PG10	107.3		1	10	12	4	4	5700	96%	<60	0.6
AM17HD2438-PG20	120.3		2	20	15	8	20	22800	94%	<60	0.68

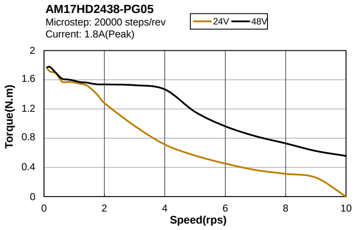
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

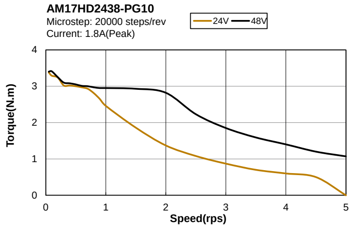
■ Torque Curves

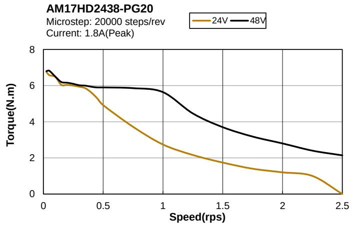






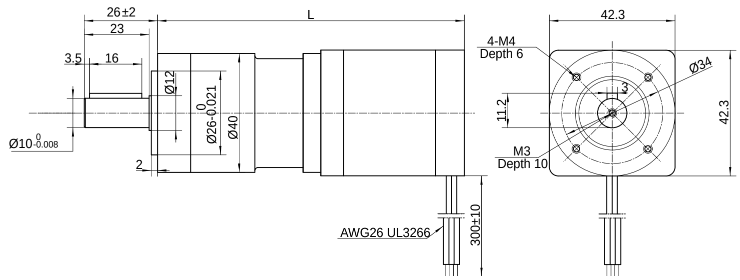






NEMA17(□42mm) 2-phase DC 1.8°- 17HD Series Gearbox Type

■ Dimensions (Unit: mm)

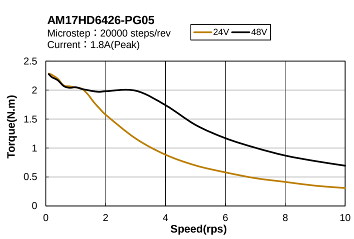


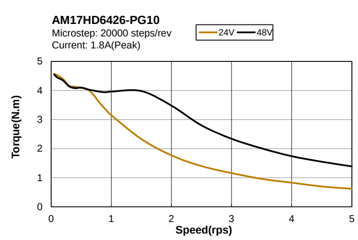
■ Parameters

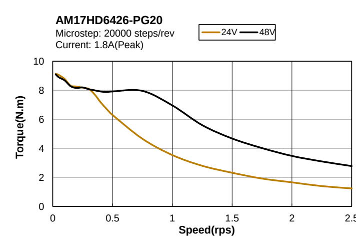
Model	Length"L"	Current ※	Series	Reduction ratio	Accuracy	Maximum output torque	Maximum load torque	Rotor Inertia	Efficiency	Noise	Mass
	mm	A/Phase			arc-min	N.m	N.m	g·cm²		dB	Kg
AM17HD6426-PG05	115.8		1	5	12	2.5	6	2050	96%	<60	0.68
AM17HD6426-PG10	115.8	1.5	1	10	12	5	4	8200	96%	<60	0.68
AM17HD6426-PG20	128.8		2	20	15	10	20	32800	94%	<60	0.76
AM17HDB410-PG05	130.3		1	5	12	4.25	6	3075	96%	<60	0.92
AM17HDB410-PG10	130.3	1.4	1	10	12	8.5	4	12300	96%	<60	0.92
AM17HDB410-PG20	143.3		2	20	15	17	20	49200	94%	<60	1

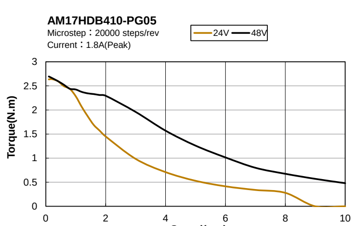
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

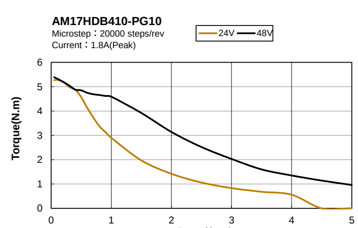
■ Torque Curves

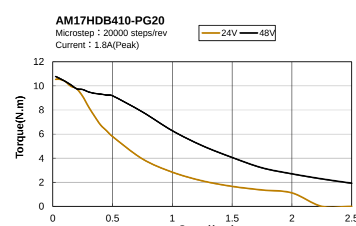






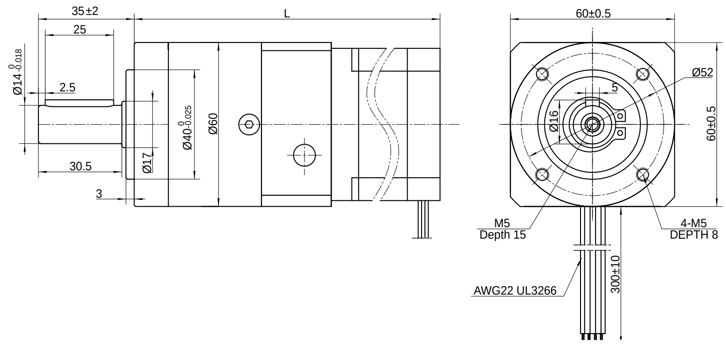






NEMA23(□56mm) 2-phase DC 1.8°- 23HS Series Gearbox Type

Dimensions (Unit: mm)

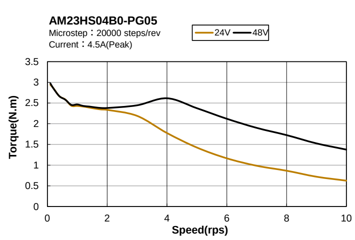


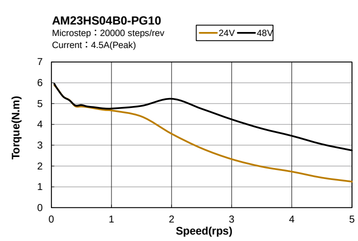
Parameters

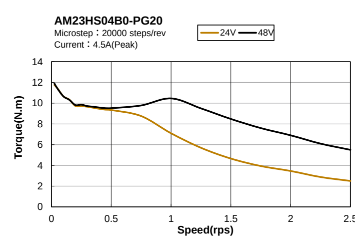
Model	Length“L”	Current ※	Series	Reduction ratio	Accuracy	Maximum output torque	Maximum load torque	Rotor Inertia	Efficiency	Noise	Mass
	mm	A/Phase			arc-min	N.m	N.m	g·cm²		dB	Kg
AM23HS04B0-PG05	112.5		1	5	10	4.1	16	2625	96%	<65	1.23
AM23HS04B0-PG10	112.5		1	10	10	8.2	12	10500	96%	<65	1.23
AM23HS04B0-PG20	125.5		2	20	15	16.4	44	42000	94%	<60	1.44
AM23HS84B0-PG05	128.5		1	5	10	7.5	16	5375	96%	<65	1.43
AM23HS84B0-PG10	128.5	3.7	1	10	10	15	12	21500	96%	<65	1.43
AM23HS84B0-PG20	141.5		2	20	15	30	44	86000	94%	<60	1.64
AM23HSA4B0-PG05	150.5		1	5	10	11.5	16	9125	96%	<65	1.83
AM23HSA4B0-PG10	150.5		1	10	10	23	12	36500	96%	<65	1.83
AM23HSA4B0-PG20	163.5		2	20	15	46	44	146000	94%	<60	2.07

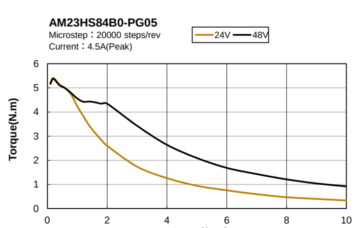
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

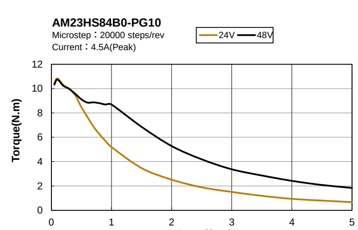
Torque Curves

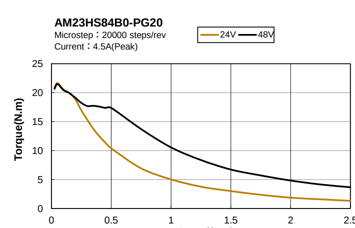


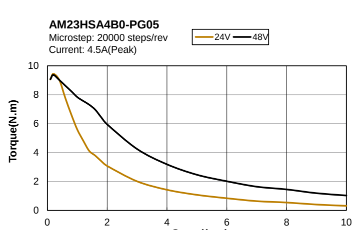


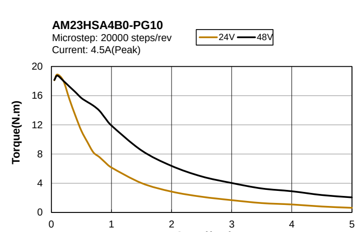


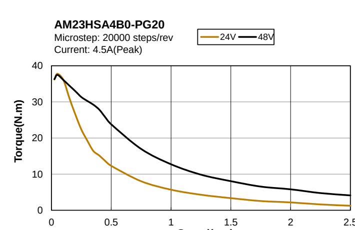






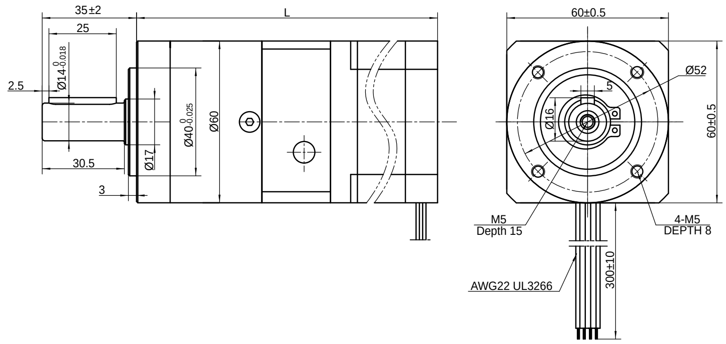






NEMA24(□60mm) 2-phase DC 1.8°- 24HS Series Gearbox Type

■ Dimensions (Unit: mm)

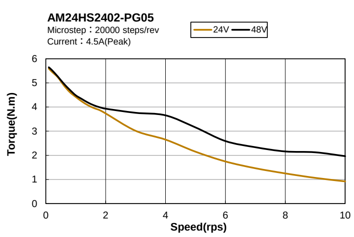


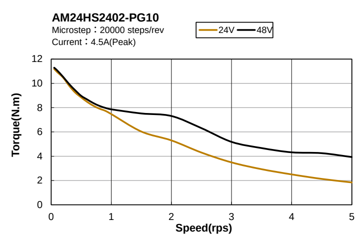
■ Parameters

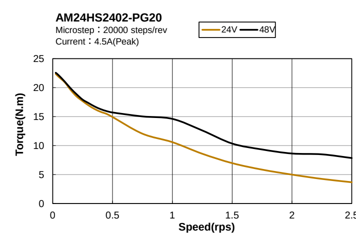
Model	Length"L"	Current ※	Series	Reduction ratio	Accuracy	Maximum output torque	Maximum load torque	Rotor Inertia	Efficiency	Noise	Mass
	mm	A/Phase			arc-min	N.m	N.m	g·cm^2		dB	Kg
AM24HS2402-PG05	127.5	4.0	1	5	10	6	16	11250	96%	<65	1.66
AM24HS2402-PG10	127.5		1	10	10	12	12	45000	96%	<65	1.66
AM24HS2402-PG20	140.5		2	20	15	24	44	180000	94%	<60	1.87
AM24HS5401-PG05	158.5		1	5	10	12.5	16	22500	96%	<65	2.23
AM24HS5401-PG10	158.5		1	10	10	25	12	90000	96%	<65	2.23
AM24HS5401-PG20	171.5		2	20	15	50	44	360000	94%	<60	2.44

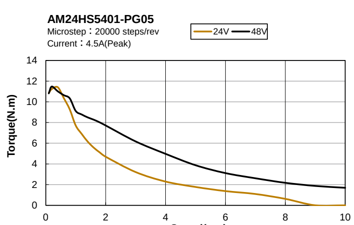
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

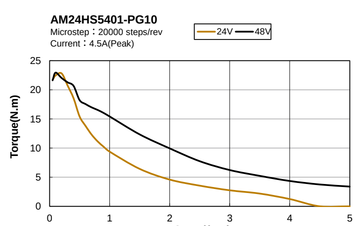
■ Torque Curves

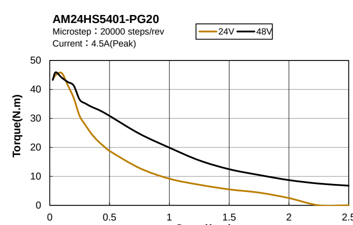






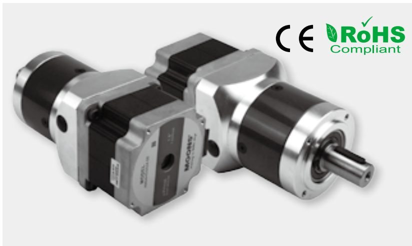


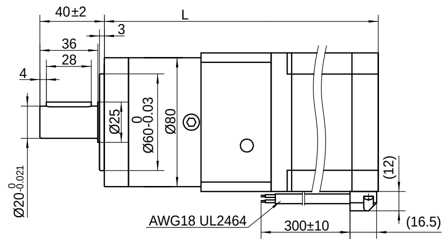


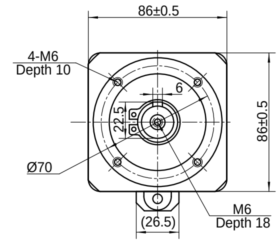


NEMA34(□86mm) 2-phase DC 1.8°- 34HD Series Gearbox Type

■ Dimensions (Unit: mm)





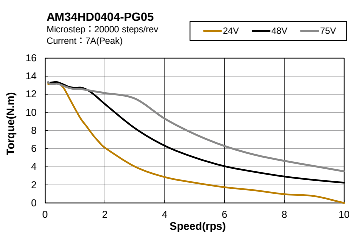


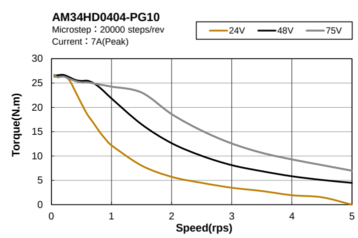
■ Parameters

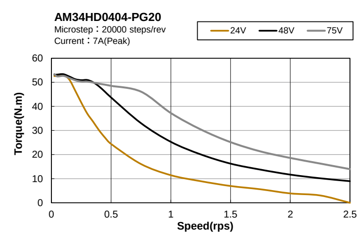
Model	Length"L"	Current ※	Series	Reduction ratio	Accuracy	Maximum output torque	Maximum load torque	Rotor Inertia	Efficiency	Noise	Mass
	mm	A/Phase			arc-min	N.m	N.m	g·cm²		dB	Kg
AM34HD0404-PG05	170.5	6.3	1	5	10	15	50	27500	96%		3.71
AM34HD0404-PG10	170.5		1	10	10	30	40	110000	96%		3.71
AM34HD0404-PG20	188.5		2	20	15	60	120	440000	94%		4.21
AM34HD1404-PG05	200		1	5	10	25	50	46250	96%		4.81
AM34HD1404-PG10	200		1	10	10	50	40	185000	96%	<60	4.81
AM34HD1404-PG20	218		2	20	15	100	120	740000	94%		5.31
AM34HD2403-PG05	229.5	5.6	1	5	10	35.5	50	68750	96%		5.91
AM34HD2403-PG10	229.5		1	10	10	71	40	275000	96%		5.91
AM34HD2403-PG20	247.5		2	20	15	142	120	1100000	94%		6.41

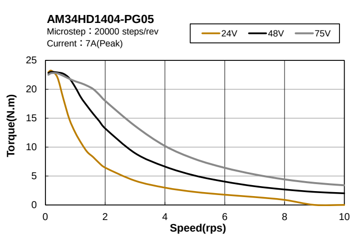
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

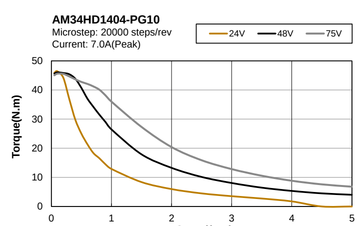
■ Torque Curves

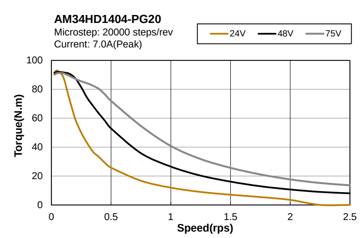


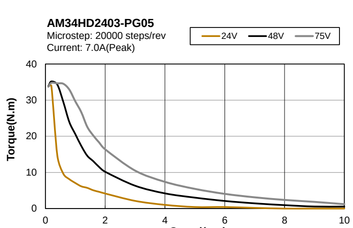


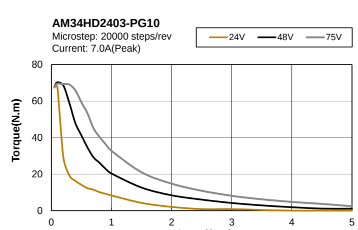


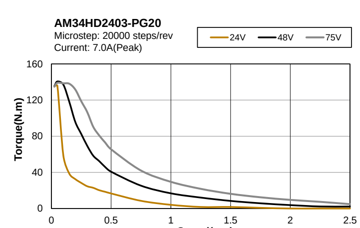




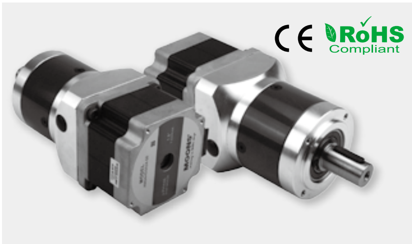


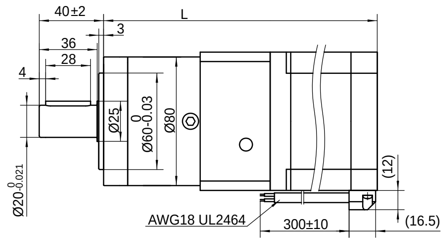


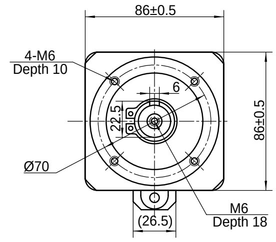




Dimensions (Unit: mm)





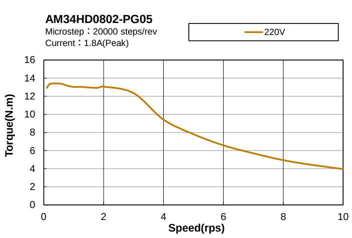


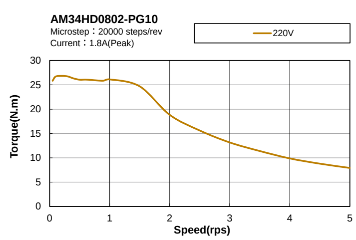
Parameters

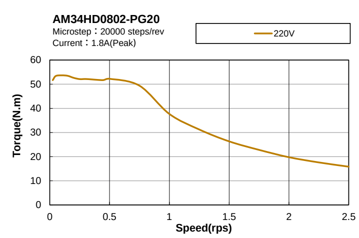
Model	Length"L"	Current ※	Series	Reduction ratio	Accuracy	Maximum output torque	Maximum load torque	Rotor Inertia	Efficiency	Noise	Mass
	mm	A/Phase			arc-min	N.m	N.m	g·cm^2		dB	Kg
AM34HD0802-PG05	170.5	1.8 (Series)	1	5	10	15	50	27500	96%	<60	3.71
AM34HD0802-PG10	170.5		1	10	10	30	40	110000	96%	<60	3.71
AM34HD0802-PG20	188.5		2	20	15	60	120	440000	94%	<60	4.21
AM34HD1802-PG05	200		1	5	10	25	50	46250	96%	<60	4.81
AM34HD1802-PG10	200		1	10	10	50	40	185000	96%	<60	4.81
AM34HD1802-PG20	218		2	20	15	100	120	740000	94%	<60	5.31
AM34HD2805-PG05	229.5		1	5	10	35.5	50	68750	96%	<60	5.91
AM34HD2805-PG10	229.5		1	10	10	71	40	275000	96%	<60	5.91
AM34HD2805-PG20	247.5		2	20	15	142	120	1100000	94%	<60	6.41

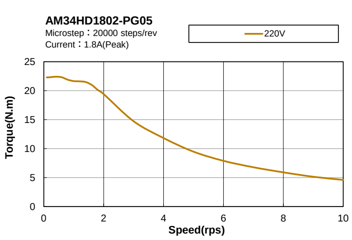
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

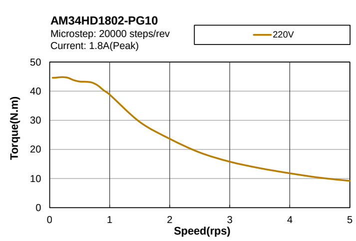
Torque Curves

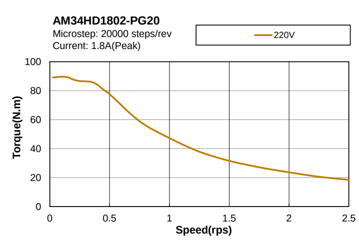


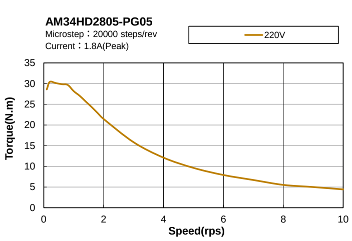


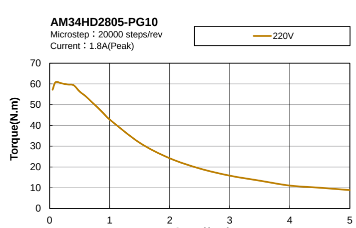


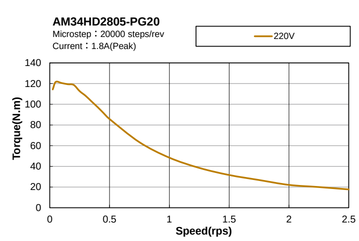










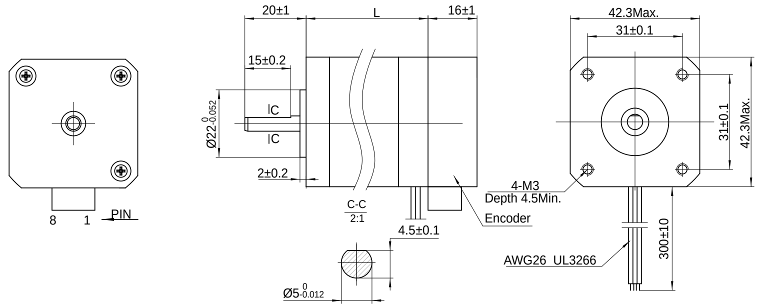


Encoder Type Motor

The encoder adopts A/B/Z differential output incremental encoder, so it can improve anti-interference.

NEMA17(□42mm) 2-phase DC 1.8°- 17HD Series Encoder Type

Dimensions (Unit: mm)

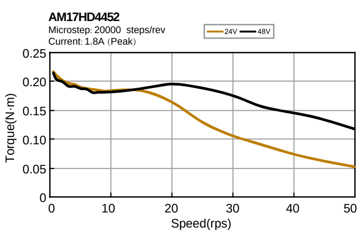


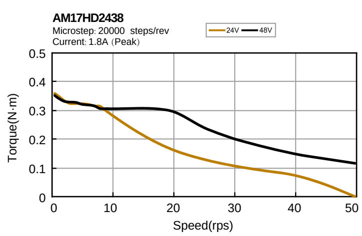
Parameters

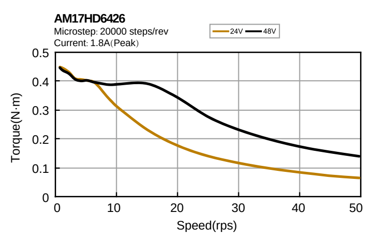
Model	Encoder		Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength
	Type	Resolution	mm	N·m	A/Phase	Ω/Phase	$g \cdot cm^2$	Kg	
AM17HD4452-F1000D	Incremental Encoder	4000 Counts/Rev (1000 Line)	34.3	0.285	1.5	1.5	38.0	0.24	500VAC 1 minute
AM17HD2438-F1000D			39.8	0.46	1.5	1.9	57.0	0.29	
AM17HD6426-F1000D			48.3	0.59	1.5	2.3	82.0	0.37	
AM17HDB410-F1000D			62.8	0.85	1.4	3.2	123.0	0.61	

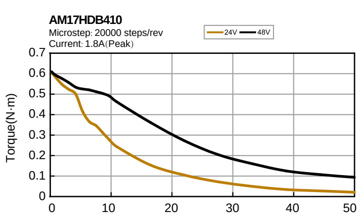
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

Torque Curves



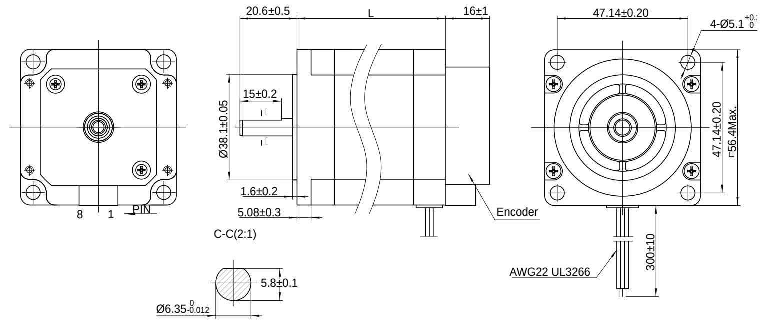






NEMA23(□56mm) 2-phase DC 1.8°- 23HS Series Encoder Type(6.35mm shaft)

■ Dimensions (Unit: mm)

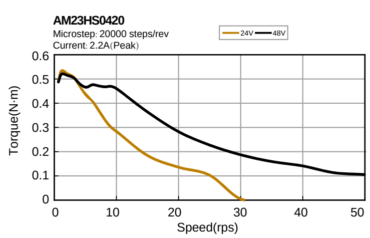


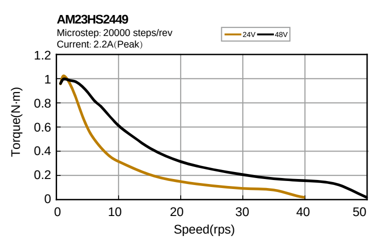
■ Parameters

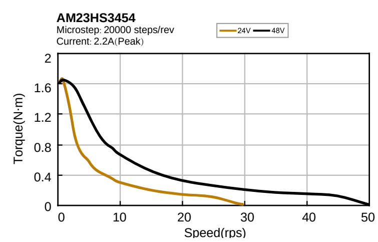
Model	Encoder		Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength
	Type	Resolution	mm	N·m	A/Phase	Ω/Phase	g·cm²	Kg	
AM23HS04A0-F1000D	Incremental Encoder	4000 Counts/Rev (1000 Line)	39	0.82	1.8	1.8	105.0	0.41	500VAC 1 minute
AM23HS84A0-F1000D			55	1.5		2.4	215.0	0.61	
AM23HSA4A0-F1000D			77	2.3		3.0	365.0	1.01	
AM23HS04B0-F1000D			39	0.82	3.7	0.48	105.0	0.41	
AM23HS84B0-F1000D			55	1.4		0.63	215.0	0.61	
AM23HSA4B0-F1000D			77	2.3		0.75	365.0	1.01	

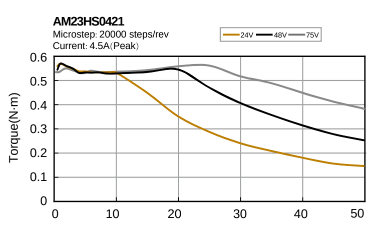
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

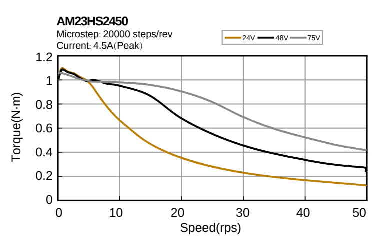
■ Torque Curves

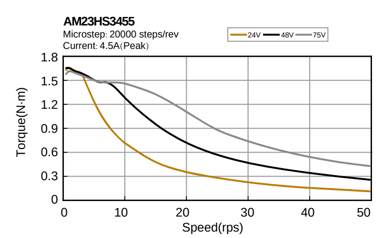






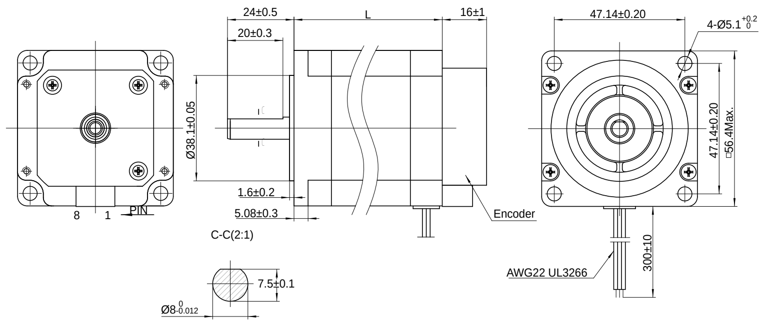






NEMA23(□56mm) 2-phase DC 1.8°- 23HS Series Encoder Type（8mm shaft）

■ Dimensions (Unit: mm)

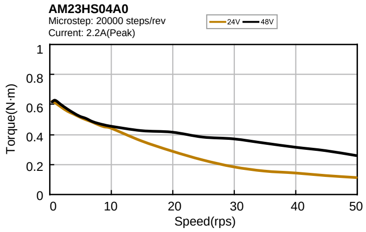


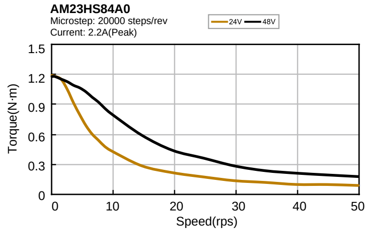
■ Parameters

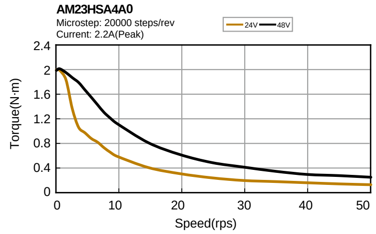
Model	Encoder		Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength
	Type	Resolution	mm	N·m	A/Phase	Ω/Phase	g·cm²	Kg	
AM23HS04A0-F1000D-M01	Incremental Encoder	4000 Counts/Rev (1000 Line)	39	0.82	1.8	1.8	105.0	0.41	500VAC 1 minute
AM23HS84A0-F1000D-M01			55	1.5		2.4	215.0	0.61	
AM23HSA4A0-F1000D-M01			77	2.3		3.0	365.0	1.01	
AM23HS04B0-F1000D-M01			39	0.82	3.7	0.48	105.0	0.41	
AM23HS84B0-F1000D-M01			55	1.4		0.63	215.0	0.61	
AM23HSA4B0-F1000D-M01			77	2.3		0.75	365.0	1.01	

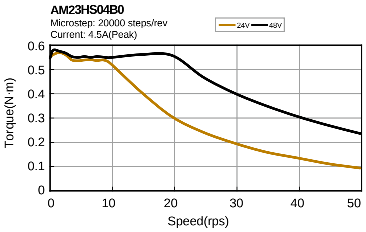
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

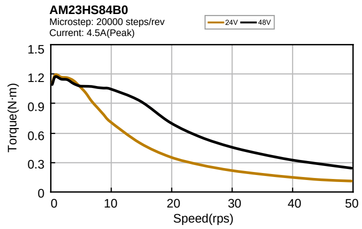
■ Torque Curves

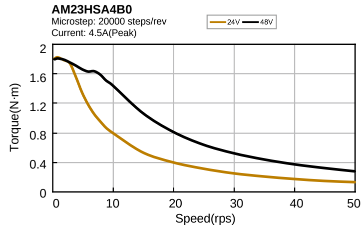






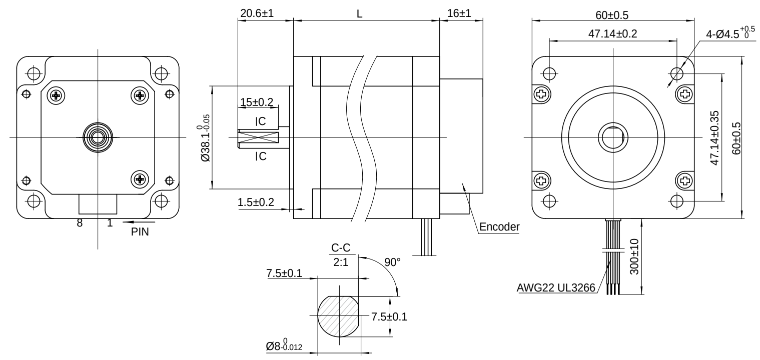






NEMA24(□60mm) 2-phase DC 1.8°- 24HS Series Encoder Type

■ Dimensions (Unit: mm)

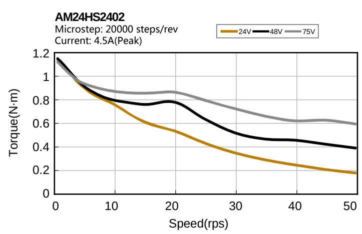


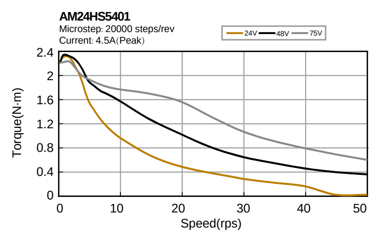
■ Parameters

Model	Encoder		Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength
	Type	Resolution	mm	N·m	A/Phase	Ω/Phase	g·cm²	Kg	
AM24HS2402-F1000D	Incremental Encoder	4000 Counts/Rev (1000 Line)	54.0	1.57	4.0	0.43	450.0	0.84	500VAC 1 minute
AM24HS5401-F1000D			85.0	3.2	4.0	0.65	900.0	1.41	

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

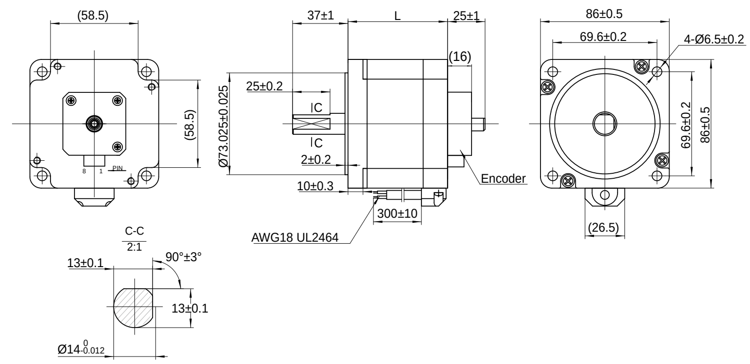
■ Torque Curves





NEMA34(□86mm) 2-phase DC 1.8°- 34HD Series Encoder Type

■ Dimensions (Unit: mm)

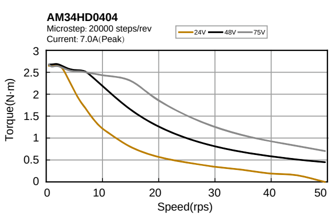


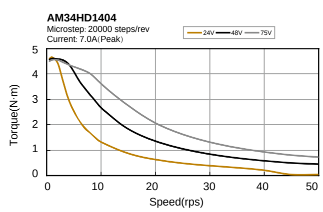
■ Parameters

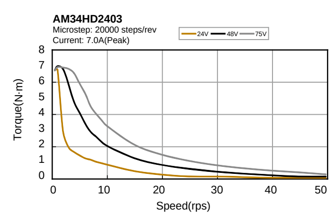
Model	Encoder		Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength
	Type	Resolution	mm	N·m	A/Phase	Ω/Phase	g·cm²	Kg	
AM34HD0404-F1000D	Incremental Encoder	4000 Counts/Rev (1000 Line)	66.5	3.7	6.3	0.25	1100.0	1.61	500VAC 1 minute
AM34HD1404-F1000D			96.0	6.7		0.35	1850.0	2.71	
AM34HD2403-F1000D			125.5	9.4	5.6	0.49	2750.0	3.81	
AM34HD3402-F1000D			156	11.5		0.63	4400.0	5.21	

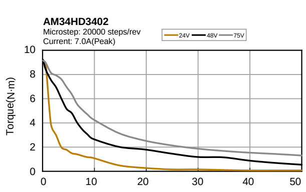
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Torque Curves



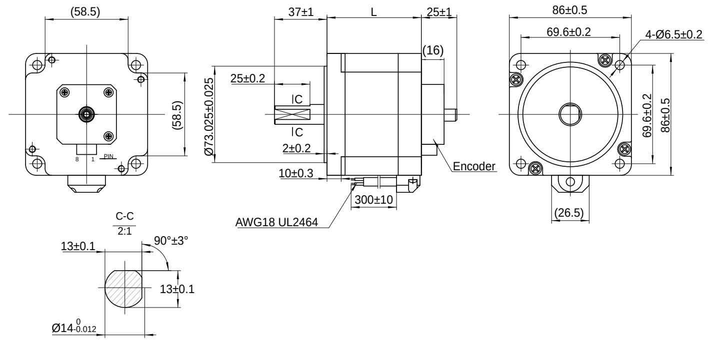






NEMA34(□86mm) 2-phase AC 1.8°- 34HD Series Encoder Type

■ Dimensions (Unit: mm)

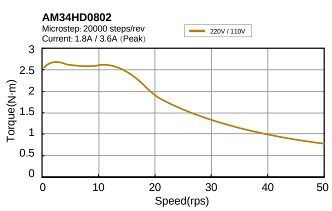


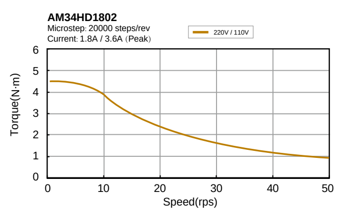
■ Parameters

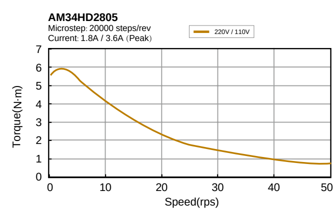
Model	Encoder		Length"L"	Holding Torque	Current ※	Resistance	Rotor Inertia	Motor Mass	Dielectric Strength
	Type	Resolution	mm	N·m	A/Phase	Ω/Phase	g·cm^2	Kg	
AM34HD0802-F1000D	Incremental Encoder	4000 Counts/Rev (1000 Line)	66.5	4.2	1.8	3.4	1100.0	1.61	1500VAC 1 minute
AM34HD1802-F1000D			96	7.3		3.6	1850.0	2.71	
AM34HD2805-F1000D			125.5	8.7		4.2	2750.0	3.81	

※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Torque Curves







Encode Electrical Specification

Resolution	4000 Counts/Rev(1000 Line)
Supply Current (no load)	5V±10%
Output mode	A/B/Z differential output
Speed Range	3600rpm

A leads B for clockwise shaft rotation, and B leads A for counterclockwise rotation viewed from direction H

Mating Connectors

Housing：NSHR-08V-S (JST)

Crimp：SSHL-003T-P0.2 (JST)

Cables Specification

Pin	7	5	3	1
Signal	Z+	B+	A+	5V
Pin	8	6	4	2
Signal	Z-	B-	A-	GND

Accessories(Sold Separately)

General encoder Cable

P/N：1144-0100 Length：1m

P/N：1144-0300 Length：3m

P/N：1144-0500 Length：5m

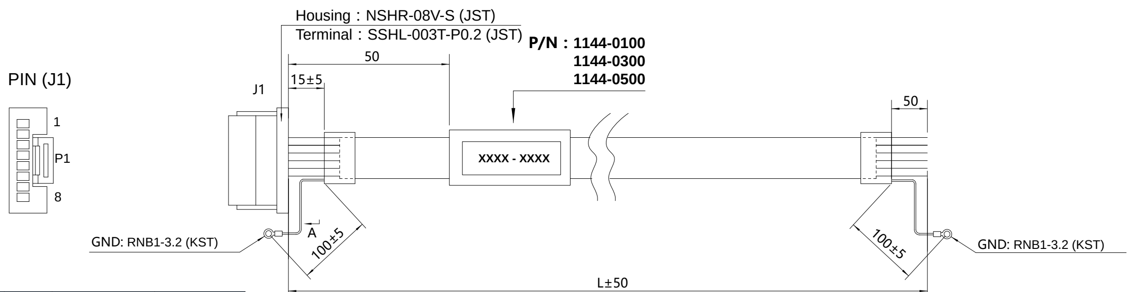
Encoder cable used with MOONS’ drive

P/N：2140-0100 Length：1m

P/N：2140-0300 Length：3m

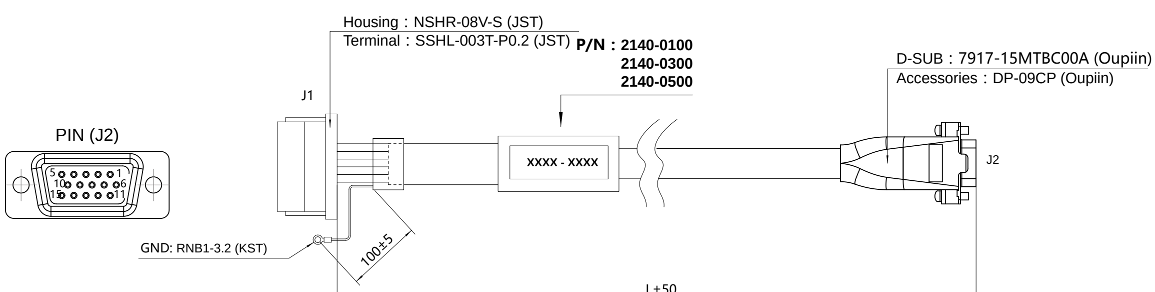
P/N：2140-0500 Length：5m

■ General encoder Cable



J1	J2	Signal	Color
1	7	+5V	Red
2	8	GND	White
3	1	A+	Yellow
4	2	A-	Green
5	3	B+	Blue
6	4	B-	Black
7	5	Z+	Orange
8	6	Z-	Grey

■ Encoder cable used with MOONS’ drive



J1	J2	Signal
1	7	+5V
2	8	GND
3	1	A+
4	2	A-
5	3	B+
6	4	B-
7	5	Z+
8	6	Z-

Hollow Shaft Type Motor

The inner hole of the hollow shaft motor is mainly used for wiring, light transmission or ventilation. The design of the hollow shaft motor greatly optimizes the mechanical design, facilitates wiring, and saves design space and production costs. Hollow shaft motors have a wide range of applications, it can be used as water pumps, ventilation equipment, boosting equipment, small hydroelectric generators, and propellers. The advantages are: reduced volume, weight, noise, integrated multi-purpose, reduced cost, simple manufacturing and convenient use.


Light transmission


Pass the wire harness


Dispensing system

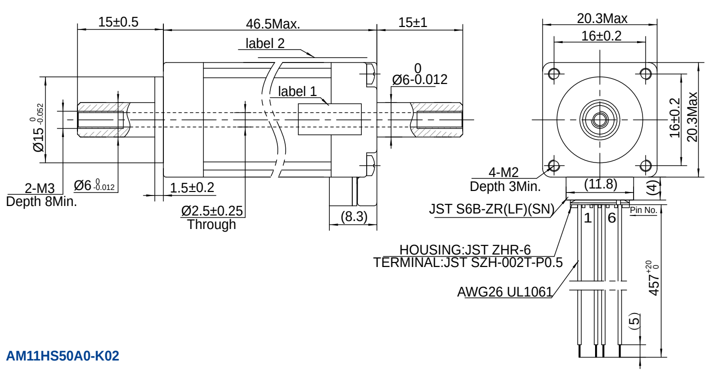
■ Parameters

Model	Outer diameter	Inner diameter	Length"L" mm	HoldingTorque N·m	Current ※ A/Phase	Resistance Ω/Phase	Rotor Inertia $g·cm^2$	Motor Mass Kg	Dielectric Strength
AM8HY40A0-K02	6	2.5	46.5	0.054	0.6	8	4.2	0.08	500VAC 1 minute
AM11HS50A0-K02	7	3	51	0.19	1.0	4.5	18	0.2	

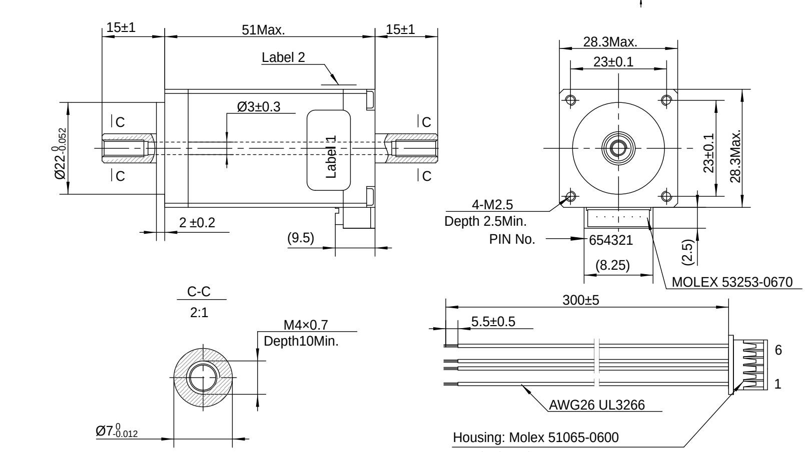
※ 1.The rated current of the motor is RMS value. 2.The output current of Moons' drive is the peak of sine value. 3.Drive maximum peak current = motor rated current x1.4.

■ Dimensions (Unit: mm)

AM8HY40A0-K02



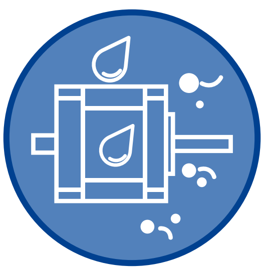
AM11HS50A0-K02



Vacuum Application Motor

Vacuum motors will not bring pollutants into the environment, so they are very suitable for sensitive environments that need to avoid outgassing, especially in the semiconductor manufacturing process. At the same time, vacuum motors are usually used in vacuum chambers for testing and manufacturing. Spaceships and satellites.

No system is 100% effective. Heat is generated when the motor coils are energized. When conventional motors are used in vacuum applications, heat becomes a problem. There are two main reasons for this: reduced motor performance and shorter motor life. The magnetic field strength of the permanent magnet will decrease with the increase of heat, which will cause the performance of the motor to decrease. This directly affects the torque output of the motor; at certain temperatures, the motor will stop running completely. Secondly, heat greatly affects the life of the bearings used in the motor, thus shortening the life of the entire system. In a vacuum environment, the gas is removed, there is almost no convection, and heat is dissipated from the motor. Although the design of a conventional motor takes heat convection into consideration, when a conventional stepper is operated in a vacuum environment, heat will quickly accumulate and overcome the motor.



When the gas trapped inside the motor expands, it introduces harmful pollutants into the environment, which greatly affects other nearby components, such as sensors and sensitive instruments. In a vacuum environment, exhaust must be avoided at all costs. This is why our vacuum rated motors are designed to minimize exhaust. All motor components (end cover, stator, rotor and screws) are made of low outgassing materials. Special sealed bearings are also included in the design. In addition, all components are thoroughly cleaned and vacuum baked. After the baking process is completed, the motor is assembled in a clean room environment and vacuum sealed to ensure that no contaminants enter the packaging during transportation.

Cleaning Room

Since the vacuum rated motor will not bring pollutants into the environment, it is very suitable for sensitive environments where exhaust gas needs to be avoided, especially in the semiconductor manufacturing process, where even the smallest pollution may destroy the yield.

Vacuum Room

Vacuum rated motors are usually used in vacuum chambers for testing and manufacturing.

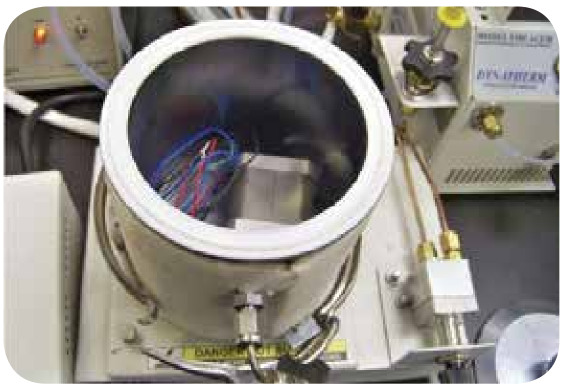
Aerospace

Applications of vacuum rated motors specifically designed for satellites and spacecraft range from communication antennas to vehicle control.

In order to create the cleanest motor on the market, we created our own motor assembly process and tested the results with known competitors' motors. To this end, we put the motor in the positive flow chamber (nitrogen gas flow rate is 1mm/1min), and measured its displacement within 72 hours at a temperature of 125°C. Then, we made the following measurements:

Percentage of total mass loss (TML)- The larger the percentage, the more serious the sample contamination.

Quality loss (microgram / motor)- This is the weight of the mass evaporated from the sample into the chamber. The larger the number, the more serious the sample contamination.



Conclusion:

Test sample	Percentage of total mass loss (TML)	Quality loss (microgram / motor)
Competitor	0.03	105000
MOONS'	0.008	29000

11HS series（□ 28mm）
Max. Holding Torque:
0.12N.m

17HD series（□ 42mm）
Max. Holding Torque:
0.88N.m

23HS series（□ 57mm）
Max. Holding Torque:
2.08N.m

High/Low Temperature Ambient Motor

The rated operating temperature of MOONS' standard motors is -20°C to 50°C. Although it satisfies most of the applications, in some applications, it is impossible for the motor to run above or below the temperature range. Running the standard motor anywhere outside of these temperature ranges will cause the motor to degrade. Like any specific application problem, an electric motor that must operate under extreme conditions of high temperature and cold requires key design features to suit its use. Whether your application is in the desert or in the freezing temperatures of the Arctic, MOONS' can provide you with the right motor.

Ⅰ type	The working environment temperature is -40 degrees Celsius (-40 degrees Fahrenheit) to 80 degrees Celsius (176 degrees Fahrenheit), and the case temperature can reach 110 degrees Celsius (230 degrees Fahrenheit).
Ⅱ type	The working environment temperature is -40 degrees Celsius to 110 degrees Celsius (230 degrees Fahrenheit), and the maximum case temperature is 140 degrees Celsius (284 degrees Fahrenheit)

Three components that are sensitive to temperature changes in design need to be adjusted.

Magnet in Rotor

Winding

Ball bearing

Unless a special alloy with high temperature resistance and high Curie point is used, the performance of the magnet will be reduced. This application has similar effects to the use of alloys in space or vacuum. For these applications, the wires must have a special insulation layer, which can also withstand high temperatures. The upgraded insulation material also helps reduce stress fractures caused by heating and cooling cycles. Type II motors require additional insulating materials to prevent burnout.

Bearings for hot/cold motors require special greases, depending on whether they are used at high or low temperatures, and can be selected at the time of purchase for the specific application to be used.

By using higher grade and specially formulated materials, the motor can be designed to far exceed the limit temperature that a standard motor can withstand. Under extreme temperature conditions may affect the use of the motor.

At present, most of MOONS' motors belong to type I, but type II motors can also be used in the following industries:

Food Processing

Commonly used in food production and packaging applications. IP65 and IPX7 use FDA approved paint, suitable for flushing procedures.

Aerospace

IP65 and IPX7 stepper motors are commonly used in aerospace applications, which expose the motor to extreme environments. For example: wing control surfaces, landing gear and other externally installed applications.

Medical

Medical and laboratory equipment, such as liquid handlers or equipment exposed to moisture or particles.

Harsh environment

Any application involving dust, liquid or corrosion.

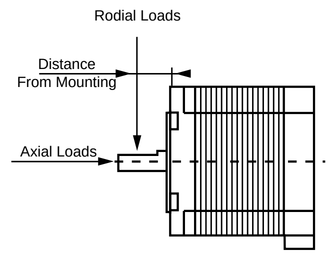
Customized Series：

17HD series (□ 42mm)
Max. Holding Torque: 0.88N.m

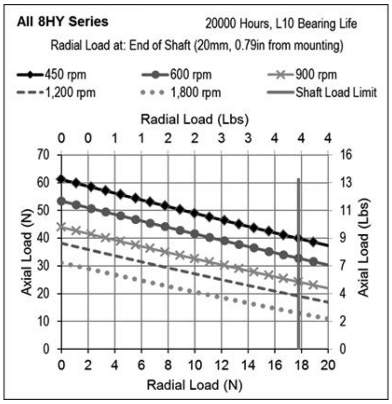
Bearing Life & Shaft Loading

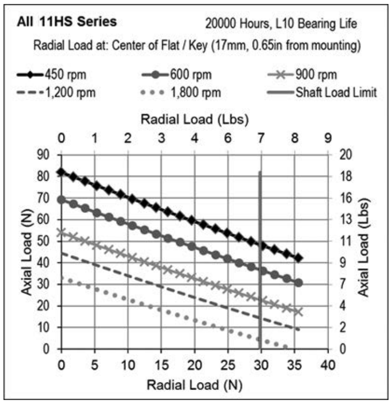
Moons' uses heavy duty long life bearings for long life from every motor. Most motors can be provided with larger bearings and custom construction to meet the most demanding applicatons.

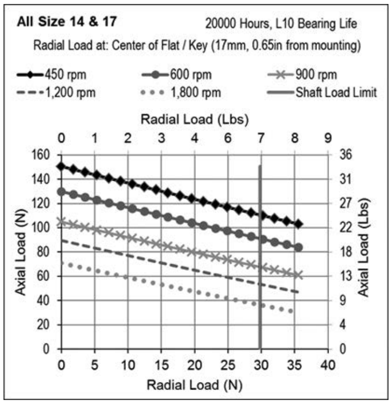
These bearing life curves represent the maximum axial and radial loads for 20,000 hours L10 bearing life at various speeds. The shaft radial load limit (and bearing load ratings) are highly dependent on the distance from the mounting face where the load is appliced. These curves were calculated with the radial load applied at the distance from the mounting face shown on the curve (usually the center of the flat / keyway).

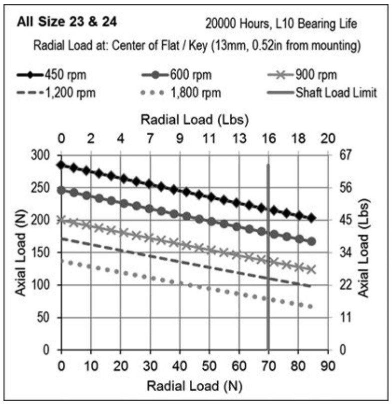


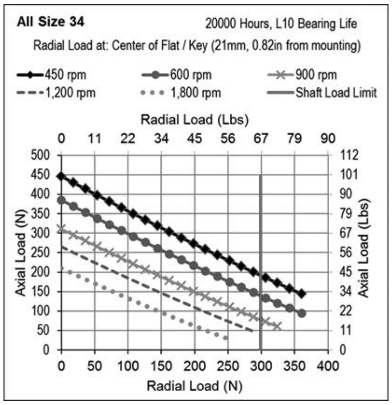
A common cause for shaft (and bearing) failure, are high radial loads that are created when a pulley is attached to the motor shaft at a large distance from the motor mounting face, and the belt has high tension. To avoid this condition mount pulleys and gears as close to the face of the motor as possible, and avoid over tightening belts. This will dramatically reduce the shaft stress, and increases the life of the bearings.

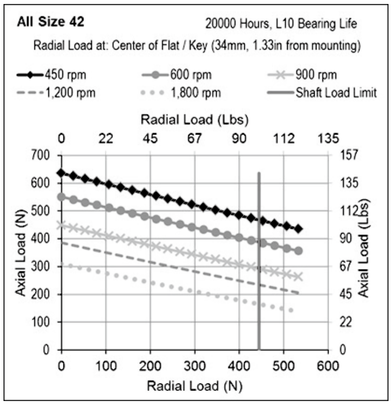












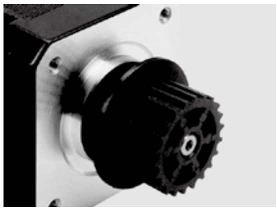
Options

MOONS' provides various customized motor solutions according to application needs. Common customizations include:

• Anti-corrosion motor, suitable for outdoor applications, such as high humidity environment, severe temperature change environment, etc.
• Sealed motor, suitable for dusty environment, dirty environment with small temperature change, etc.
• Special shaft, such as size, shape, etc.
• Pulleys, gears and couplings, etc.
• Encoders and other feedback components.
• Lead wire length and customer use terminal connector.

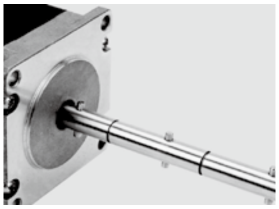
Pulley and Gear


Metal Pulley

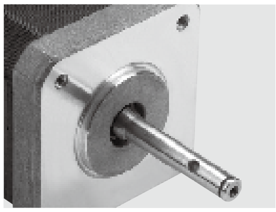

Plastic Pulley


Gear

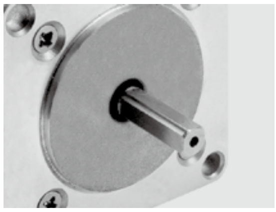
Shaft Configuration

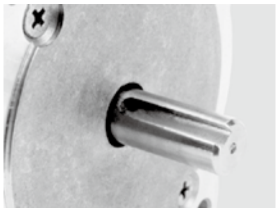

Dowel

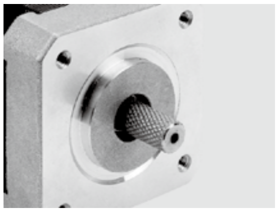

Worm Shaft

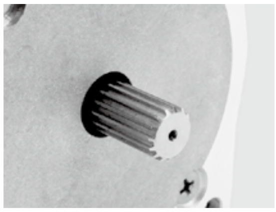

Cross Drilled Shaft


Single Flat


Double Flat

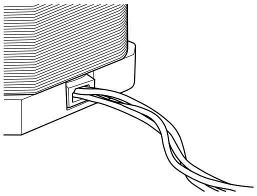

Key Way

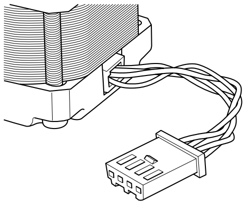

Knurl

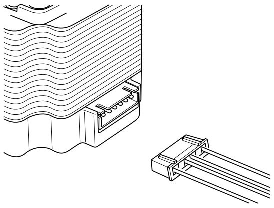

Hobbed Gear


Hobbing

Connection Configuration


Lead Wire

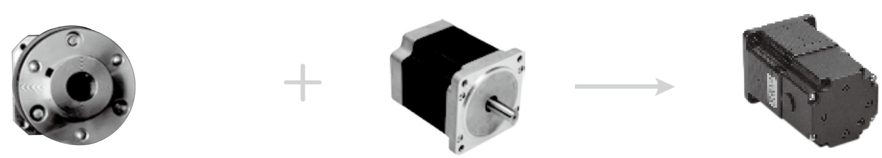

Lead Wire with Connector


Connector with harness

Encoder Option

Gearbox Option

Brake Option



Glossary

Absolute Position
Position referenced to a fixed zero or "home" position

Absolute Programming
A positioning coordinate reference wherein all positions are specified relative to some reference or "home" position; this is different from incremental programming where distances are specified relative to the current position

Ambient Temperature
The temperature of the medium immediately surrounding a device

Amplifier
Electronic device that converts command signals (analog or digital) to high power voltages and currents for the operation of the motor

ASCII
American Standard Code for Information Interchange; this code assigns a number to each numeral and letter of the alphabet allowing information to be transmitted between machines as a series of binary numbers

Axial Play(End play)
The axial shaft displacement due to a reversal of an axial force on the shaft

Baud Rate
The number of binary bits transmitted per second for serial communications such as RS-232

Bi-level Drive (Dual Voltage Drive)
A driver where two levels of voltage are used to drive a step motor; a high (over drive) voltage is applied to the winding each time it is switched on; the high voltage stays on until the current reaches a predetermined level; the high voltage is turned off after a time period determined experimentally or by sensing winding current; the low voltage maintains the desired current

Bipolar Drive
A drive that reverses the magnetic polarity of a pole by electronically switching the polarity of the current to the winding (+ or -); bipolar drives can be used with 4, 6, or 8 lead motors; with 4 and 8 lead motors, bipolar drives are usually more efficient than unipolar drives and generally produce more torque

Brushless Servo Drive
A servo drive used to control a permanent magnet synchronous AC motor

Chopper Drive
A step motor drive that uses switching amplifiers to control motor current

Class B Insulation
Specifies motor insulation that is rated for operation up to 130°C

Class H Insulation
Specifies motor insulation that is rated for operation up to 180°C

Closed Loop
A system that uses some form of feedback device to monitor the system output; the signal from the device is used to correct any errors between actual and demanded output

Cogging
Term used to describe uneven velocity in motors usually at low speeds

Commutation
Refers to the action of steering currents or voltage to the proper motor phases to produce optimum motor torque. In brush type motors, commutation is done electromechanically via the brushes and commutator. In brushless motors, commutation is done by the switching electronics using rotor position information typically obtained from hall sensors, tachometers, resolvers or encoders.

Controller (Step Motor)
A system consisting of a DC power supply and power switches plus associated circuits to control the switches in the proper sequence

Damping
An indication of the rate of decay of a signal to its steady state value; related to settling time

Dead Band
A range of input signals for which there is no system response

Detent Torque
The maximum torque required to slowly rotate a step motor shaft with no power applied to the windings; this applies only to permanent magnet or hybrid motors; the leads are separated from each other

Drive (PWM)
A motor drive utilizing Pulse-Width Modulation techniques to control current to the motor; typically a high efficiency drive that can be used for high response applications

Drive (Servo)
A motor drive that utilizes motor position feedback with a control loop for accurate control of motor position and/or velocity

Drive (Stepper)
An electronic package to convert digital step and direction inputs to currents to drive a step motor

Duty Cycle
The percentage of ON time vs. OFF time; a device that is always on has a 100% duty cycle; half on and half off is a 50% duty cycle

Dynamic Braking
A passive technique for stopping a permanent magnet brush or brushless motor; the motor windings are shorted together through a resistor, which results in a motor braking with an exponential decrease in speed

Encoder
A device used to translate motion into electrical signals used to provide position information; often used as a position/motion feedback device in closed loop systems

Encoder Marker Pulse
A once-per-revolution signal that is provided by some incremental encoders to specify a reference point within that revolution

End Play
The axial shaft motion due to the reversal of an axial force acting on a shaft with axial clearance or low axial pre-load

Following Error
The positional error during motion between a load's actual position and the commanded position

Friction - Coulomb
A resistance to motion between non-lubricated surfaces; this force remains constant with velocity

Friction - Viscous
A resistance to motion between lubricated surfaces; this force is proportional to the relative velocity between the surfaces

Hall Sensors
A feedback device built into a motor used by a servo amplifier to electronically commutate the motor

Holding Torque (Static Torque)
The maximum restoring torque that is developed by the energized motor when the shaft is slowly rotated by external means

Hybrid Step Motor
A type of step motor comprising a permanent magnet and variable reluctance stator and rotor structures; it uses a double salient pole construction

Hysteresis (Positional)
The difference between the step positions when moving CW and the step position when moving CCW; a step motor may stop slightly short of the true position thus producing a slight difference in position CW to CCW

I/O (Inputs/Outputs)
The reception and transmission of information between control devices; I/O has two distinct forms: Digital - switches, relays, etc. which are either in an On or Off state; Analog – a continuous signal such as speed, temperature, low, etc.

Idle Current Reduction
Reduction of phase current to a step motor when no motion is required

Indexer
An electronic control device that sends pulse and direction signals for use by a step motor driver

Inductance (Mutual)
The property that exists between two current carrying conductors or coils when magnetic lines of flux from one link with those of the other

Inductance (Self)
The constant by which the rate of change of the coil current must be multiplied to give the self-induced counter EMF

Inertia
Measure of resistance of an object to changes in velocity; the larger the inertia, the more torque required to accelerate and decelerate the load

Inertial Match
Ratio of reflected load inertia to motor inertia

Instantaneous START/STOP Rate
The maximum switching rate that an unloaded step motor will follow without missing steps when starting from rest or stopping from moving

L/R Drive
A drive that uses external resistance to allow a higher voltage than that of a voltage drive; L/R drives have better performance than voltage drives, but have less performance and efficiency than a chopper drive

Loop, PID
A high performance control loop that uses Proportional, Integral and Derivative type control parameters

Loop, Position
A feedback control loop in which the controlled parameter is motor position

Loop, Velocity
A feedback control loop in which the controlled parameter is velocity

Maximum Reversing Rate
The maximum stepping rate at which an unloaded motor will reverse direction of rotation without missing steps

Maximum Slew Rate
The maximum stepping rate at which a step motor with no load will run and remain in synchronism

Microstepping
A technique in which motor steps are electronically divided by the drive into smaller steps; the most common microstep resolutions are 10, 25 and 50 steps per full step, but many resolutions ranging from 2 to 256 microsteps per full step are available

Open Frame Drive
Refers to amplifiers where a separate DC power source must be provided to the unit

Open-Loop
A system with no feedback; most step motor systems are run in this mode

Oscillator
A device that is used to produce pulses for driving a step motor at a preset speed

Overshoot
The amount a motor shaft rotates beyond the commanded stopping position

Packaged Drive
Refers to amplifiers where the power supply is included in the enclosure and 110/220VAC is used to power the unit

Permanent Magnet Step Motor
A step motor having a permanent magnet rotor and wound stator

Pull-In Rate (Response Rate)
The maximum switching rate at which an unloaded motor can start without losing step positions.

Pull-In Torque
The maximum torque load at which a step motor will start and run in synchronism with a fixed frequency stepping rate without losing step positions

Pull-out Torque
The maximum torque load that can be applied to a motor running at a fixed stepping rate while maintaining synchronism; any additional load torque will cause the motor to stall or miss steps

Pulse Rate
The rate at which successive steps are initiated or the windings switched; the pulse rate divided by the resolution of the motor/drive combination (in steps per revolution) equals the rotational speed of the motor in revolutions per second

PWM (Pulse Width Modulation)
A method of controlling motor voltage and current used in servo and step motor drivers

Radial Play (Side play)
The side-to-side movement of the shaft due to clearances between the shaft and bearing, bearing to housing, and bearing internal clearance for ball and roller bearings

Ramping
The acceleration and deceleration of a motor; may also refer to the change in frequency of the step pulse train

Rated Torque
The torque producing capability of a motor at a given speed; this is the maximum continuous torque the motor can deliver to a load

Regeneration
The action during deceleration, in which the motor acts as a generator and takes kinetic energy from the load, converts it to electrical energy, and returns it to the amplifier

Repeatability
The degree to which the positioning accuracy for a given move performed repetitively can be duplicated

Resolution
The smallest positioning increment that can be achieved; frequently defined as the number of steps or feedback units required for a motor's shaft to rotate one complete revolution

Resonance
The effect of a periodic driving force that causes a large amplitude increase at a particular frequency

Response Rate (Pull-In Rate)
The stepping rate an unloaded motor can follow from a standing start without missing steps

Ringing
Oscillation of a system following a sudden change in state

RS-232, RS-422/485
Serial communication hardware definitions

Serial Port
A digital data communications port that uses a serial bit stream for data transfer

Servo Amplifier/Servo Drive
An electronic device that converts a control signal into a current that is fed into the motor windings to produce torque in the motor

Servo System
A feedback control system for mechanical motion in which the controlled output is position or velocity; servo systems are closed loop systems

Settling Time
The elapsed time starting the instant the rotor reaches the commanded step position and the oscillations settle to within a specified displacement band around the final position

Si
MOONS' Simple Indexer operating environment; sequences for machine operation are programmed by the use of point and click instructions

Slew
The portion of a move made at a constant non-zero velocity

Stall Torque (holding or static)
The torque available from a motor at stall or zero rpm

Step Angle
The nominal angle through which the step motor shaft rotates between adjacent step positions

Step or Stepping Rate (Speed)
The number of steps a shaft rotates during a specified time interval

Step-to-step Accuracy (relative accuracy)
The maximum error that occurs between any adjacent step, expressed as a percentage of one full step

Switching Amplifier
A device that switches a high voltage on and off to control current; some amplifiers (PWM types) switch at a constant frequency and adjust duty cycle to control current, others have a fixed off time and adjust the frequency

Switching Sequence (Energizing Sequence)
The sequence and polarity of voltages applied to coils of a step motor that result in a specified direction of rotation

Thermal Time Constant
The time required for the motor winding to reach 63.2% of its final temperature

Thermal Resistance
The resistance to the flow of energy between two surfaces of the same body or different bodies; thermal resistance = degrees C/watt in the winding

Torque
The rotary equivalent of force; equal to the product of the force perpendicular to the radius of motion and distance from the center of rotation to the point where the force is applied

Torque Constant
A number representing the relationship between motor input current and motor output torque, usually expressed in units of torque/amp

Torque Displacement Curve
The holding (restoring) torque plotted as a function of rotor angular displacement with the motor energized

Torque Gradient (Stiffness)
The ratio of the change in holding torque to a particular change in shaft position when the motor is energized

Torque Ripple
The cyclical variation of generated torque given by the product of motor angular velocity and number of commutator segments

Torque-to-inertia Ratio
Ratio of a motor's torque divided by the motor's rotor inertia; the higher the ratio, the higher the acceleration may be

Unipolar Drive
The motor phase winding current is switched in one direction only; the polarity of the applied voltage to each winding is always the same; unipolar drives require 6 or 8 lead motors

Variable Reluctance Step Motor (V/R)
A step motor having a wound stator or stators with salient poles working with a soft iron rotor having salient poles on the periphery

Velocity
The change in position as a function of time; velocity has both magnitude and direction

Viscous Damping
A damper that provides a drag or friction torque proportional to acceleration; a quality used to damp unwanted oscillations of a step motor

Voltage Drive
A drive operated at the minimum voltage required to safely limit motor current; motors used with voltage drives produce less torque at higher speeds than when used with L/R or chopper drives

Wave Drive
Energizing the phases one at a time; driving the motor one phase or winding at a time

Conversion Factors

Multiply “A” units by conversion factor to obtain “B” units

Length

A \ B	mm	cm	m	inch	feet
mm	--	0.1	0.001	0.03937	0.003281
cm	10	--	0.01	0.3937	0.03281
m	1,000	100	--	39.37	3.281
inch	25.4	2.54	0.0254	--	0.08333
feet	304.8	30.48	0.348	12	--

Force

A \ B	g	kgf	oz	lb	Newton
g	--	0.001	0.03527	0.002205	0.0098
kgf	1,000	--	35.27	22.05	9.807
oz	28.35	0.02835	--	0.0625	0.278
lb	453.6	0.4536	16	--	4.448
Newton	102	0.102	3.597	0.2248	--

Torque

A \ B	Nm	Ncm	mNm	kgm*	kgcm*	gcm*	oz-in	lb-ft	lb-in
Nm	--	100	1,000	0.102	10.2	10,200	141.6	0.7376	8.851
Ncm	0.01	--	10	0.00102	0.102	102	1.416	0.007376	0.08851
mNm	0.001	0.1	--	0.000102	1.0102	10.2	0.1416	0.000738	0.008851
kgm*	9.807	980.7	9807	--	100	100,000	1,389	7.233	86.8
kgcm*	0.09807	9.807	98.07	0.01	--	1,000	13.89	0.07233	0.868
gcm*	9.81E-05	0.009807	0.09807	0.00001	0.001	--	0.01389	7.23E-05	0.000868
oz-in	0.007062	0.7062	7.062	0.00072	0.07201	72.01	--	0.00521	0.0625
lb-ft	1.356	135.6	135.6	0.1383	13.83	13,830	192	--	12
lb-in	0.113	11.3	113	0.01152	1.152	1,152	16	0.0833	--

Inertia

A \ B	kgm^2	kgcm^2	gcm^2	oz-in^2	oz-in-sec^2	lb-in^2	lb-in-sec^2	lb-ft^2	lb-ft-sec^2 (slug ft^2)
kgm^2	--	10,000	10,000,000	54,700	142	3,420	8.85	23.7	0.738
kgcm^2	0.0001	--	1,000	5.47	0.0142	0.342	0.000885	0.00237	7.38E-05
gcm^2	1E-07	0.001	--	0.00547	1.42E-05	0.000342	8.85E-07	2.37E-06	7.38E-08
oz-in^2	1.83E-05	0.1829	183	--	0.00259	0.0625	0.000162	0.000434	1.35E-05
oz-in-sec^2	0.00706	70.62	70,600	386	--	24.1	0.0625	0.168	0.00521
lb-in^2	0.000293	2.926	2,930	16	0.0414	--	0.00259	0.00694	0.000216
lb-in-sec^2	0.113	1,130	1,130,000	6,180	1.6	386	--	2.68	0.0833
lb-ft^2	0.0421	421.4	421,000	2,300	5.97	144	0.373	--	0.318
lb-ft-sec^2 (slug ft^2)	1.36	13,600	13,600,000	74,100	192	4,630	12	32.2	--

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